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CANADIAN GEOGRAPHICAL JOURNAL

Editor

Gordon M. Dallyn

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This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustrations, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth, and other parts of the world in which Canada has special interest.

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Photo by Brian Roberts

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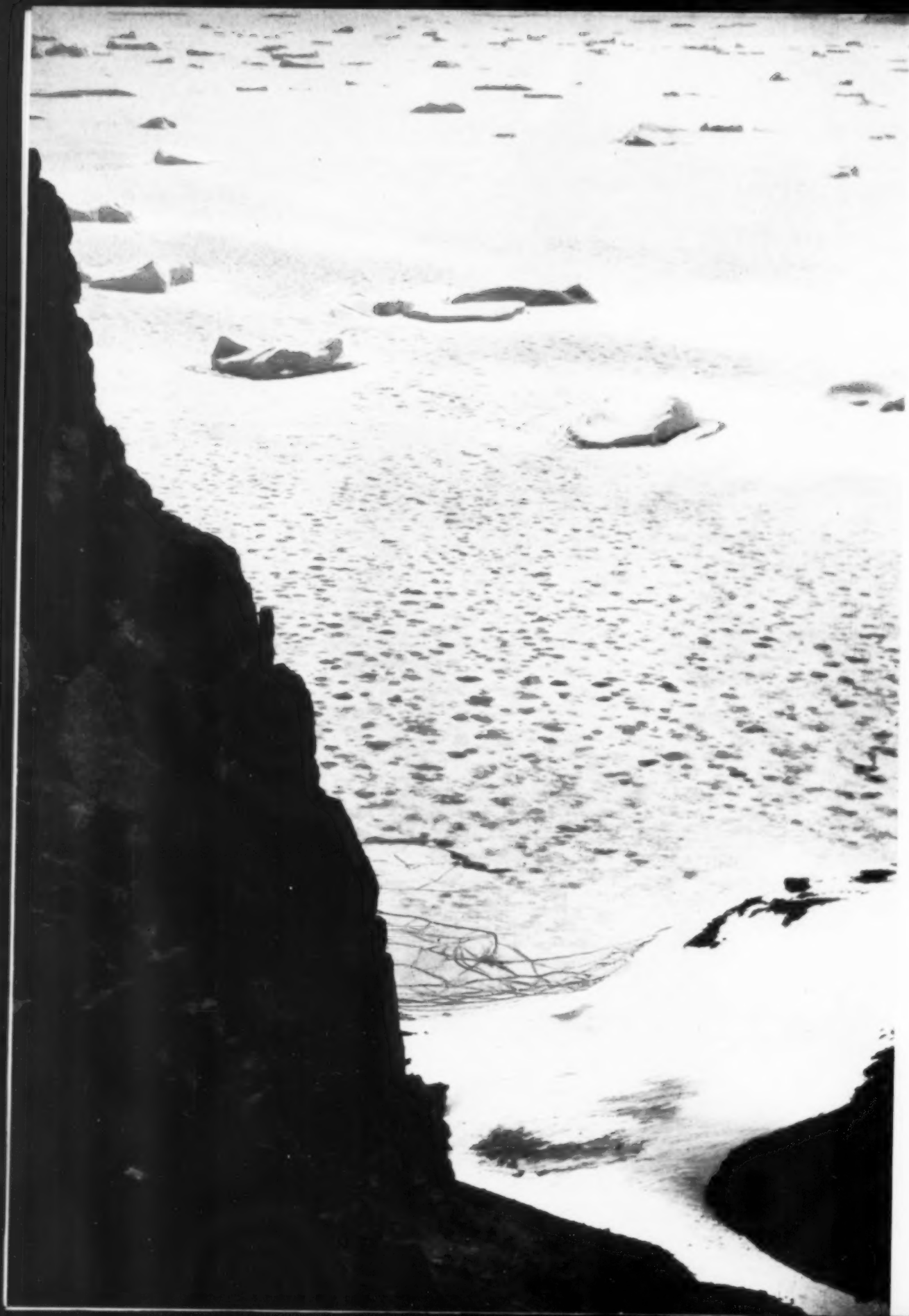
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A painted ship upon a painted sea. *Penola* with sails set to make the best of any puff of breeze. She was equipped with two 100 h.p. semi-diesel engines, but fuel had to be used sparingly.

R. E. D. Ryder

THREE ANTARCTIC YEARS*

THE BRITISH GRAHAM LAND EXPEDITION* OF 1934-1937

by LAUNCELOT FLEMING, COLIN BERTRAM, BRIAN ROBERTS

THIS is an account of the British Graham Land Expedition which spent nearly three years in that part of the Antarctic which lies south of South America and was the first British expedition to winter in Antarctica in the last twenty-five years.

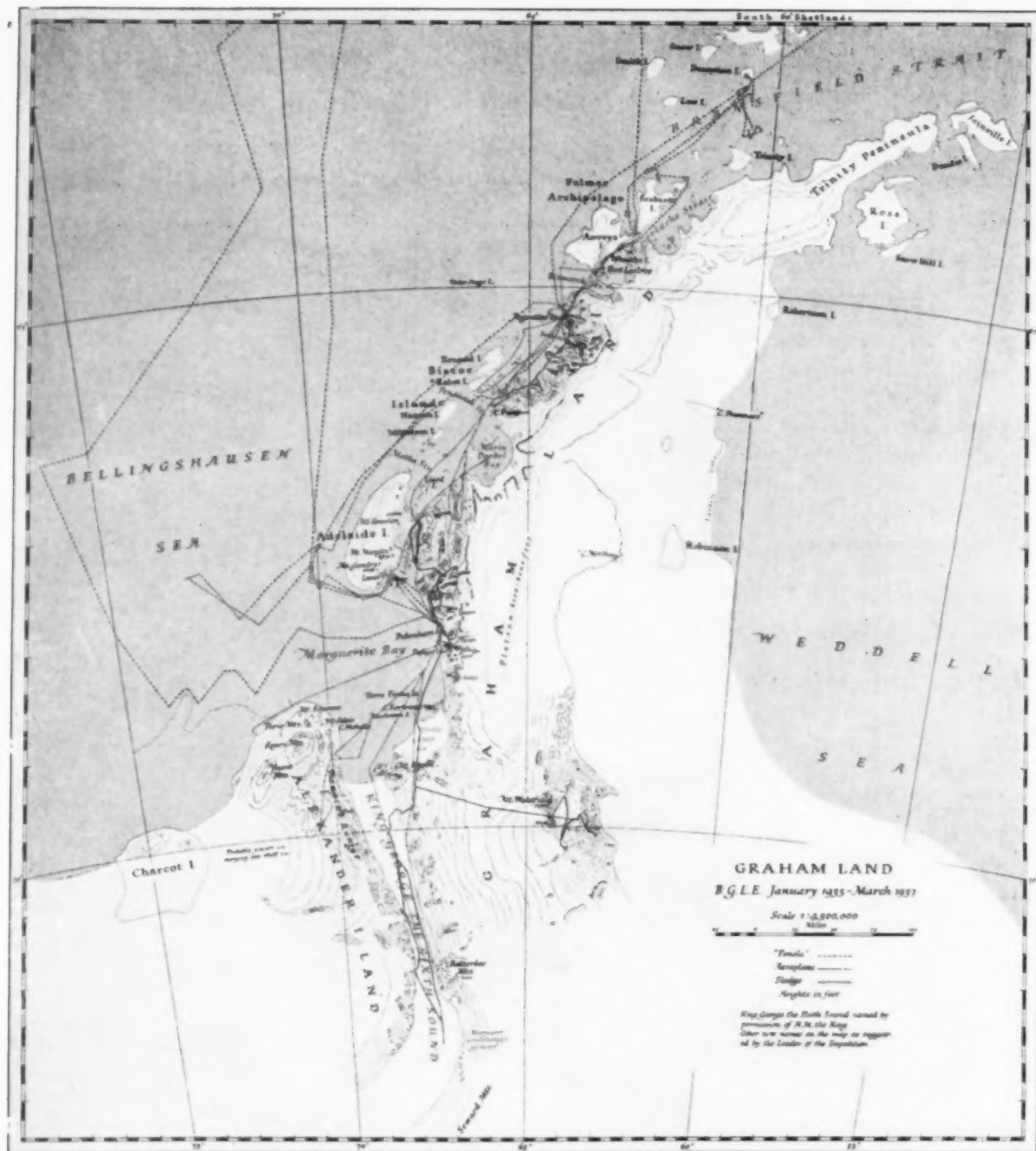
H. M. King George VI approved the award of the Polar Medal to the sixteen mem-

bers of the party — a coveted distinction — only previously granted the expeditions of Captain Scott, Sir Ernest Shackleton, Sir Douglas Mawson and Mr. Gino Watkins. The Royal Geographical Society and the American Geographical Society have also honoured the work of this expedition by giving its leader, Mr. John Rymill, their highest awards.

*Certain of the photographs illustrating this article are reproduced by arrangement with Messrs. Chatto and Windus, publishers of *Southern Lights*, the official account of the expedition by John Rymill.

Left:—Looking down a 1,000-foot cliff on to sea-ice which, in an advanced state of decay, is covered with thaw pools, and traversed by cracks along the shore and round icebergs. Three weeks later the sea-ice had been broken up and carried out to sea in small floes.

LaunceLOT Fleming



On New Year's Day, 1935, a small three-masted topsail schooner, manned by a crew of British polar explorers, ran into rough weather off Cape Horn. She was the ship of the British Graham Land Expedition 1934-37, named *R. Y. Penola* after the home in Australia of the leader, John Rymill.

At the change of the watch at midnight sixteen bells had been rung by the mate, as custom decreed, at the close of the year.

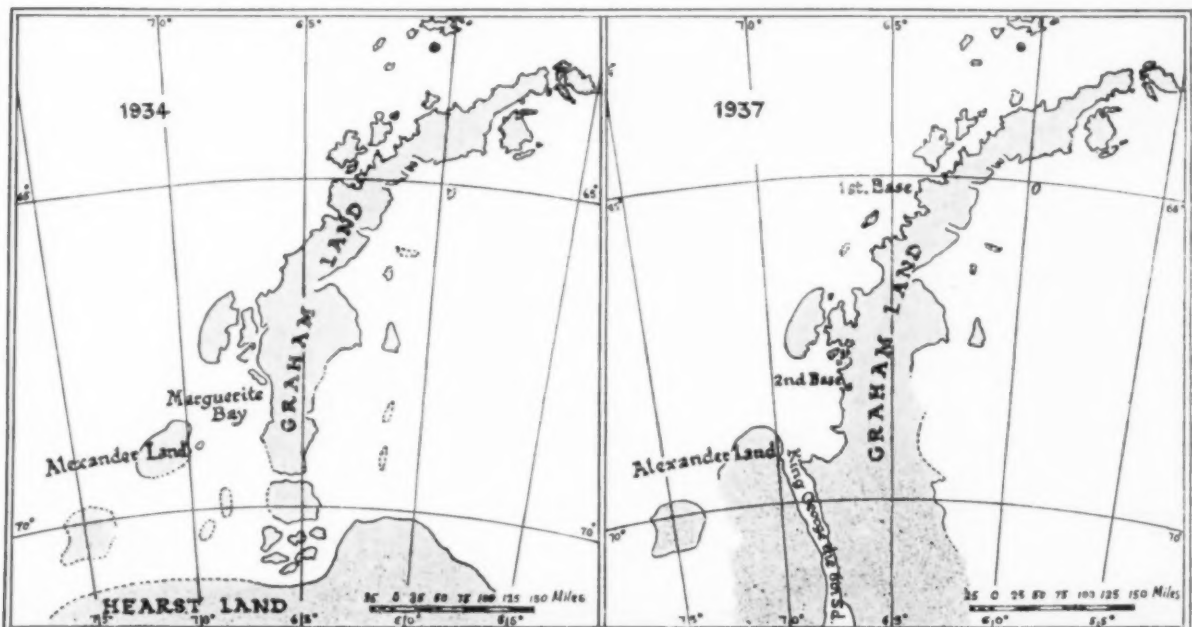
A few hours later there happened a circumstance that was to have far-reaching effects on the whole course of the expedition. Lieutenant Commander Millett, R.N., chief engineer, reported to the captain (Lieutenant Ryder, R.N.) that the ship's engines were beginning to run out of alignment. Immediate investigation showed that the working of the ship, due to the heavy seas, was causing the entire engine beds to move, relative to the hull. Such movement, small

though it then was, might suddenly put the engines completely out of action and make navigation in the southern ice well nigh impossible. Quick decisions were called for and made. *Penola* was put about, and a course set for the Falkland Islands, from which the ship had set sail not many days earlier. No time could be spared there for making repairs, or the brief Antarctic summer season of open water would be past. The only thing to be done was to take aboard some tons of cement to bind the engine beds. Stowage space for this unexpected cargo presented a difficult problem. The ship was already full, both above and below decks. The only solution was to stack the cement barrels in the centre of the tiny saloon aft, where there scarcely seemed space enough for the crew and their personal gear. But in a ship there is always room for a little more. The only two chairs aboard were broken up, the stove put out of action, and a mighty pile of barrels brought in and lashed to ring bolts and the mizzen mast.

Three days after the shifting of the engine beds, *Penola* was once more setting off on her passage across the southern ocean, but this time dependent on her sails alone. It was just four months since the expedition had sailed from London. In that time the sixteen men, scientist, army and navy officer, parson, pilot, engineer and handyman, had been moulded into a crew of able seamen, under the guidance of the ship's officers, who alone were mariners by training. This was the first expedition of any nationality to spend

more than a single winter on the Antarctic continent in the last twenty years. It was composed of men skilled in many technical jobs, survey, geology, zoology, ornithology, botany, glaciology, medicine, dog-driving, flying, meteorology and others. During the four months' sailing down the Atlantic Ocean they had put aside their special jobs, working as ordinary seamen until they could take up their researches again. In these days of steam and motor ships, the old sailing ship routes across the oceans are deserted. In seven weeks from Madeira to the River Plate but one other ship was sighted, a fine four-masted jackass barque in the Chile trade.

Penola's had been a life of change. Built in 1908 in a Breton port, she served her time with the fishing fleet on the Grand Banks. Then, since the seamen of Brittany are particular about whom they marry, she was, for a time, turned into a sea-going training ship for Breton girls. From that she rose to be an American's private yacht, fitted out in England. She was laid up for a time, until Rymill bought her and had her sheathed with green-heart and her forefoot strengthened with oak and iron. It was a three months' passage from England to Port Stanley in the Falkland Islands, where she met *R.R.S. Discovery II*, the whaling research vessel maintained by the British Colonial Office. *Discovery II* had helped many others in the course of her five commissions in the southern ocean. She had taken a doctor down from New Zealand to Admiral Byrd in the Ross Sea and she later steamed at full speed to the





Bay of Whales in 1936 to relieve Ellsworth and Kenyon after their great flight. Now *Penola* was to receive her full quota of help, for *Discovery* undertook to carry large quantities of oil fuel, the Fox Moth aeroplane and all the dogs as far south as Port Lockroy in northern Graham Land. In Port Stanley, *Penola* was relieved of her fore and mizzen topmasts, yards and jib-boom, to facilitate navigation in the ice. She spent Christmas with the kindly people of the islands and then sailed south across the Cape Horn seas.

Three weeks of alternate calm and storm brought *Penola* into the still waters behind the islands of the Graham Land coast, and there the real work of the expedition began. At a little cove under the ice-cliffs, graced with the name of Port Lockroy, the Fox Moth aeroplane was rigged. Amid the indignant squawks of countless penguins and an excited chorus of Greenland and Labrador dogs, the sound of the aeroplane's engine passed overhead, as she made a wide circle above the anchorage before her first flight of reconnaissance. With the ship in her crippled condition, it was essential to find some safe nook which she could reach without a battle with the ice, where she could lie snugly through the winter while repairs were made, and from which, at the same time, journeys of exploration could be made.

Such a place was spotted from the plane among the Argentine Islands, where the twistings of narrow creeks served admirably to allow *Penola* in, but kept all heavy ice and pressure out. A few hours' work with blasting powder cleared a passage in the creeks, and *Penola* came to anchor in her winter quarters, there to remain for the following nine months. At once the forty

(1) The motor launch with sail set goes off for a day's sealing.

Brian Roberts

(2) Hampton and Riley loading rations on board the *Stella* for a sledging trip on the mainland. This motor boat had been used in Greenland by Watkins' last expedition.

E. W. Bingham

(3) The southern base hut in process of construction — a job which the nine members of the shore party completed within three weeks.

Launcelot Fleming

(4) The base hut at the Debenham Islands after a blizzard. Provisions and boats are almost wholly concealed by snow drifts. Note the wire hawsers which are lashed across the roof of the hut and hangar to give them additional stability against the force of the winds.

E. W. Bingham



Ship and plane lying at Stella Creek at the Argentine Islands. This is one of the safest harbours that has yet been discovered and used by an Antarctic expedition.

Brian Roberts

dogs were disembarked, and then began the building, on a raised beach, of the expedition's base hut. Whilst some were thus employed as carpenters, others started intensive sealing operations. There were sixteen men, forty dogs, and many pups expected, all of which would need meat in the coming winter. For the next two years, save on sledge journeys, seal meat was to be eaten twice a day by every man. Bully beef was a luxury reserved for special occasions. By the end of the expedition 550 Weddell and Crabeater seals had been killed to provide nearly a hundred tons of meat and blubber. This slaughter, incidentally, furnished Bertram, the biologist, with a great mass of detailed information, scores of skulls, ovaries and other specimens to help him elucidate the breeding biology of the species.

Within a few days of the completion of the wooden base hut and the final securing of the ship, scientific work was begun in earnest. The meteorological station, 150 feet up at the top of the island's miniature ice dome, was installed and regular observa-

tions started. Stephenson, the chief surveyor, then began the local map of the Argentine and adjacent islands. He could



Colin Bertram looks over the doctor's shoulder, who is reading the account of a former expedition. The party learnt much from their interest in the technique and fortunes of the explorers of the past.

A. Stephenson

Right:—*Penola* lying snugly at her winter anchorage in the Argentine Islands. At the top of the hill on the horizon are some members of the party close to the meteorological instruments.

L. C. D. Ryder

Below:—A primitive means of crossing Stella Creek during the freeze-up. Sabotage was suspected when the scientists who constructed the rope bridge always made safe passages — and the others were less fortunate.

Launcelot Fleming



Above:—The winter aerodrome near the southern base — a smooth stretch of sea-ice covered with snow that had been firmly packed by the wind.

E. W. Bingham

Right:—"So near, but yet so far." Rymill improvises a convenient method of getting about from floe to floe after helping some of the others to bring in a seal.

Launcelot Fleming

Top right:—Bertram uses the rope bridge that he and Roberts made across the creek.

Brian Roberts





Left: — *Penola* silhouetted against the 100-foot ice cliffs that are such a characteristic feature of the western coast of Graham Land.

Brian Roberts

Below: — At the end of the sealing season it might take three or four hours to force the motor boat through the newly formed sea-ice out into the freer waters of the sound. On this occasion Moore climbed out of the boat on to the newly formed ice pans in order to push.

Launcelot Fleming



Left: — A summer wind of over-hurricane strength lashes the water and tears off the tops of the waves as a cloud of low spray.

Brian Roberts



Above: — When the sea froze over in the autumn of 1936, the *Stella* was beached for the winter — an operation which was made much easier with the help of the small Bristol tractor.

Launcelot Fleming

Left: — Meiklejohn at the controls of the *Iron Duke*, a craft consisting mainly of a forty-gallon oil drum, which was quite useful within the quiet waters of *Stella* Creek.

Launcelot Fleming

Top left: — The character of the ice cap on this little island is peculiar to the Graham Land region. The ice originally accumulated as part of a sheet of shelf-ice or permanent sea-ice which not long ago covered the sea and surrounded this island. Since the break-away of the shelf-ice, the exposure of the northern slopes to sunshine and to the force of relatively warm northerly winds has moulded the ice into this whale-back shape.

Launcelot Fleming





It requires all the ingenuity of the photographer's art to suggest the dazzling brilliance of the patterned lights from the mainland ice-falls or the crystalline blue of old decayed icebergs when the sun is shining on them.

Mt. William, near Port Lockroy, in brilliant sunshine

Brian Roberts

Brian Roberts





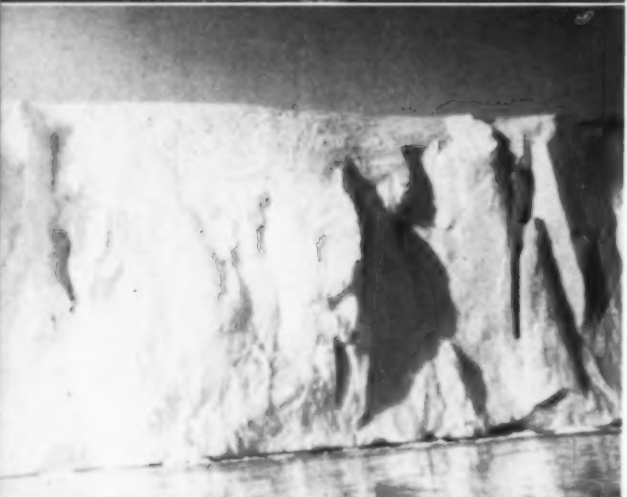
Penola motoring past Adelaide Island — one of the larger mountains off the Graham Land coast. For mile after mile the shore is formed by a wall of ice cliffs averaging 100 feet in height.

Launcelot Fleming

Penola's first anchorage

Brian Roberts





also reach the nearer portions of the mainland coast by motor boat. Roberts, the ornithologist, was at work making regular observations of the penguins, petrels, gulls and shags. Bird-banding experiments, begun by him at this time, were later to prove that the tiny Wilson's petrel, which lays its egg in a burrow within the scanty moss patches of Graham Land, spends eight months of the year over the open ocean. In those months it migrates northwards thousands of miles, perhaps to catch a glimpse of the Everglades of Florida or the sky-line of New York, before returning the next season to its same homely burrow in these remote islands of Graham Land, there to meet its previous mate. Fleming, the geologist and glaciologist, in the early days at the Argentine Islands, was already engaged on his long series of studies of the rock and ice forms. Especially peculiar was the fringe of glaciers, often only a few score feet from back to front, that skirt the Graham Land shore and terminate in a continuous band of gleaming ice cliffs some hundred feet high.

The advent of the winter freeze-up was the signal for engineers Millett and Moore to start their laborious and unpleasant task. In the dank chill of the small and silent engine room, it was their lot, crawling like animals on their bellies, to fit iron bars and a network of wires between the thwart-wise timbers that composed the engine beds. The rest of the expedition soon came to realize that the oaths of engineers are in direct proportion to their efficiency, and the skill of Millett and Moore was, in fact, of the highest order. In a few weeks the spaces between the engine

(1) A view from the air looking over an island toward the west coast of Graham Land. The sea is frozen over and holds in its grip a number of small icebergs.

Brian Roberts

(2) Drifting snow blown off the snout of a glacier in a blizzard. The suddenness with which the wind gathers force is one of the most dangerous features of this coast.

Brian Roberts

(3) The walled front of a large iceberg detached from a remnant of shelf or "barrier" ice at the back of Beascochea Bay. This ice wall is over 100 feet high, but four or five times that thickness are submerged.

Launcelot Fleming

(4) The aeroplane taxis out for a flight of reconnaissance. Summer flying off the water was often tricky work owing to the rapidly shifting patches of brash ice.

Launcelot Fleming

beds were a veritable maze of well-placed iron. Then came the task, performed by Martin, the mate, Gurney and Carse, of digging sand and gravel from beneath the ice covering of the island's beaches, bringing it aboard, and mixing it with cement to form some dozen tons of concrete. Again it was the engineers' turn to pour the concrete into their skeleton of iron, so that the timbers bearing the engines and the hull itself were finally bound together as a single solid piece. No further movement of the engine beds was any longer possible. Soon after midwinter, progress with this work was well enough advanced to relieve the party's minds of the misgivings they felt about their ship.

Then an incident occurred which gave rise to grave anxiety on quite another score. The ornithologist developed appendicitis and his condition quickly became really serious. The risks of an operation in such a place are necessarily far greater than they are at home — even though Surgeon-Commander Bingham was well equipped to carry it out. Members of the expedition were detailed off as dressers and sterilizers, the room was scrubbed and washed. The time arrived when, with the knives laid out, the surgeon in conference with the leader, decided that he must operate at the end of half an hour, if by that time no marked change for the better was visible in the patient. Perhaps the patient heard the ultimatum, or perhaps it was the hand of Providence, but twenty-five minutes later, his pulse began to ease and his temperature to fall. The crisis was passed, the ornithologist recovered and, within six weeks, was back at work.

From the geographical point of view this first winter and succeeding spring in



(1) Looking out to sea from the Graham Land coast in early summer. Scattered lumps of floating ice are all that is now left of the previous winter's sea-ice.

Launcelot Fleming



(2) The forlorn appearance of the base as seen from *Penola* during an eight-day blizzard when no communication, other than signalling, was possible across the 100 yards of wind-swept water that separated ship and shore party.

Brian Roberts



(3) A 'Cloister berg' from *Penola*. Even on so calm a day it is wise to give every iceberg a wide berth, in case it should capsize.

Launcelot Fleming



(4) The *Stella* tows the plane out to a patch of ice-free water from which she may take off in safety.

Launcelot Fleming



Extreme left:—Lieutenant-Commander H. Millett, R.N., the ship's chief engineer. Millett had the exacting task of maintaining engines which were in bad condition when the ship was originally purchased. He was often called upon to devise scientific instruments, cooking utensils and innumerable odds and ends.

Launcelot Fleming

Left:—Lieutenant R. E. D. Ryder, R.N. — selected from a large number of naval officers to serve as captain of *Penola*. In August 1937 he brought his small ship safely back to Falmouth after covering nearly 27,000 miles during the three years she was under his command.

Launcelot Fleming



Extreme left:—Surgeon-Commander E. W. Bingham, R.N. — an experienced Arctic traveller, who was the expedition's doctor and also responsible for the care and training of the dogs.

Brian Roberts

Left:—Wilfrid Hampton, second-in-command and pilot of the expedition's plane, whose qualities Rymill had come to know when they travelled together in Greenland.

Launcelot Fleming



Extreme left:—Alfred Stephenson, the chief surveyor and meteorologist, led the sledge party which mapped King George VI Sound. He had gained experience of the polar regions under Watkins in Greenland and with the British Polar Year Expedition in Northern Canada.

Brian Roberts

Left:—Verner Carse, on leaving Sherborne School, sailed before the mast in a windjammer from London to Australia and back, then joined the Royal Research Ship, *Discovery II*, for one of her Antarctic Commissions and was transferred to *Penola* in December, 1934, at the Falkland Islands, and served with the ship's party throughout the remainder of the expedition. Carse is an accomplished pianist and a fine boxer. On returning home he was employed as a B.B.C. announcer.

Launcelot Fleming



Extreme left:—Jim Moore, *Penola*'s second engineer and a member of the shore party when the expedition reached the Antarctic.

A. Stephenson

Centre:—Colin Bertram, the expedition's biologist, had been in the Arctic several times before he was asked to join Graham Land Expedition. Bertram was an excellent seaman and sledger. His main work was to study the Antarctic seals.

Launcelot Fleming

Left:—Lieutenant I. F. Meiklejohn of the Royal Corps of Signals was appointed by the War Office to accompany the expedition as its radio officer. Meiklejohn kept daily schedules with the wireless station at Port Stanley, in the Falkland Islands. In this way members of the expedition were able to keep in touch with news and their families at home.

J. I. Moore

Right:—(L. to R.) Dennis MacAtasney, Syd Barnes, Tom Hennah, and the cook — all from the Falkland Islands — who joined the ship's party in 1936 and helped sail *Penola* back to England.

Launcelot Fleming



Extreme right:—Lisle Ryder — elder brother of *Penola's* captain — a fine amateur yachtsman, who was *Penola's* second mate. Ryder is a captain in the Royal Norfolk Regiment. His skill as a carpenter was an important asset to the expedition.

Brian Roberts

Right:—John Rymill, leader of the expedition, who had gained his experience of polar travel with Gino Watkins during two expeditions in Greenland.

Launcelot Fleming



Extreme right:—Brian Roberts, ornithologist, was one of those responsible for the recent revival of interest in polar exploration amongst university men in England. On account of a severe attack of appendicitis, he was transferred from the shore to the ship's party when the ship went to the Falkland Islands to refit. His appendix was successfully removed in the hospital at Port Stanley.

Launcelot Fleming

Right:—Quintin Riley standing beside the motor launch which he looked after. Riley's duties also included the care of stores and he was one of the meteorologists.

A. Stephenson



Extreme right:—Launcelot Fleming, Dean and Chaplain of Trinity Hall, Cambridge — was given leave of absence to join the expedition as its chaplain and geologist.

Colin Bertram

Right:—James Martin, the mate, educated at Harrow, and for a time an officer in the Guards, has spent many years at sea. He has been to Australia on a grain ship, in the North on a Norwegian sealer, and was a member of Sir Douglas Mawson's second Antarctic Expedition. He also undertook an adventurous sledge journey in Northern Canada.

Launcelot Fleming



Extreme right:—Norman Gurney, a member of the ship's party. Gurney, who is training for the ministry, joined the expedition when he was still an undergraduate at Trinity Hall, Cambridge.

Brian Roberts

Graham Land was a great disappointment. The defects in the ship's engines had prevented further penetration to the south in the season of open water, but it had been hoped that this could be compensated by travelsouthwards over the sea-ice. Fate decreed otherwise. A combination of powerful gales and an upwelling of warm currents kept open an area of sea, 100 miles to the south of the Argentine Islands, that proved impassable to further coast-wise travel throughout the winter and spring. Exploration in the first season was limited to the short stretch of coast nearer the base, where, for a few weeks, there was sea-ice over which sledge parties could move. The work done at this time was highly detailed, interesting and valuable, but this did not alter the fact that the main plans had been thwarted.

Past regrets, however, soon gave place to future hopes, and when summer came, *Penola* was moved out from the berth that she had so safely occupied throughout the preceding nine months. Between the Argentine Islands the winter ice still lingered, and this had to be cut with ice-saws and pushed out of the creek before the ship was freed. Once beyond the islands, there were only loose floes and, with the engines mended, these offered no serious obstacle.

When *Penola* was released, she sailed, with a crew of eight, northwards to Deception Island. There, in years gone by, had been a whaling station, now deserted and falling into decay. To an Antarctic expedition, a disused whaling station is treasure trove. There was enough old timber to build a complete new base, sheet metal to roof it, and coal to supplement the expedition's limited supply. Even a few pounds of ancient, but still edible, bacon and a giant can of marmalade were not to be despised.

At Deception Island there is one of the largest penguin rookeries in the world. It

is many acres in extent, and there are more than a pair of birds to every square yard. The tumult of their cries was like that of a vast football crowd roaring its applause.

One thing most eagerly awaited here was the mail left some months before by Lincoln Ellsworth in the *Wyatt Earp* prior to his unsuccessful flight of 1935. It was so strange an experience to get letters after receiving none for many months, that some men just fingered their pile of envelopes, pondering their possible contents, and, to heighten their anticipation, left them unopened to another day. The letters had been written almost a year before and even one more day would enhance the thrill of reading.

While *Penola* had been sailing up to Deception Island, those remaining at the Argentine Islands had been by no means idle. A series of aeroplane reconnaissance flights had been made far along the coast both to north and south, obtaining photographs to fill in details in the ground survey. An attempt was also made to sledge up to the main Graham Land plateau opposite the base. From the air there appeared to be only a single possible route, winding up the glaciers between the razor-edged ridges until the plateau top was reached at about 8,000 feet. Rymill, Stephenson and Fleming attempted the ascent with dog-teams, but were forced to give up after a week's struggle amongst an impenetrable maze of crevasses.

As soon as she arrived back at the base, *Penola* was fully laden, the last scientific observations at the Argentine Islands were taken, and at 6 a.m. on February 16th she moved south for the new season's work, on which now mainly depended the expedition's success.

Before she sailed, certain small anchorages had been observed from the air, and these were welcome refuges from the weather. *Penola* was extremely heavily laden, and the dogs, now increased to more than eighty in number, were chained in rows on top of the deck cargo. With the ship rolling forty-five degrees each way in a heavy swell, their lot was not to be envied. For that matter, it was no luxury trip for the ship's crew; the captain lived in his chart house on deck; Bertram and Roberts crawled for their sleep into the two-foot space that remained in the biological laboratory between piles of cases and the deck above; Riley and Fleming vainly tried to obtain



The Crabeater seal is essentially an inhabitant of the pack-ice. It has teeth like Christmas trees, which interlock and filter its crustacean food from the cold waters of the South.

Colin Bertram



Crabeater seals on a floe. These seals know so little of man that if one of this group were shot and the hunter then landed on the floe, as likely as not, the other two would take no notice.

Brian Roberts

comfort and warmth in the fo'c'sle, and Meiklejohn offered shower baths in his wireless office!

Ten days after leaving the Argentine Islands *Penola* came to anchor at the Léonie Islands in the northern part of Marguerite Bay. At once a wireless message was sent to Stephenson and Hampton, who had remained behind with the plane at the old base. On receipt of the message they boarded up the house, painted a notice on its door — "This House To Let, season 1936-37" — and flew southwards to join the ship.

Next day the plane was off again to look for a new base site on the southern side of Marguerite Bay. This was found at a raised beach on a small group of islands about a quarter of a mile from the mainland ice cliffs. The islands were low rocky mounds, none of them more than 200 yards in length. Being six in number, they were appropriately named the Debenham Islands, after the six children of the Professor of Geography in Cambridge, to which university so many members of the expedition belonged. As soon as *Penola* had unloaded the timber and stores for the

new base, she set sail to the Falkland Islands: for the ship was to spend the second winter there and at South Georgia, undergoing a much needed refit. The shore party left behind was of nine men, and their's was the task of extending geographical knowledge to the south.

Before *Penola* left, the aeroplane had made a flight to the south which gave the entire party new encouragement in their work. For the first time during the course of the expedition, a vast new territory of unknown land was discovered. This "new land" consisted of successive ranges of mountains which appeared in a position where they were least to be expected. The high backbone of Graham Land sweeps south in a gently curving arc. These new mountains, however, lie athwart this direction to form a great mass projecting west from the mainland. What was even more remarkable, the new country seemed to link Graham Land on the east with the massive group of peaks which Bellingshausen, years before, had named Alexander I Land on the west, as if to form one continuous range limiting the southern end of Marguerite Bay and lying perhaps only



Unloading the de Havilland
Fox Moth plane from
R.R.S. *Discovery II* at Port
Lockroy.
W. E. Hampton

Rymill turns on the ignition
switch. This picture was taken
before a reconnaissance flight
in early spring.

E. W. Bingham



The *Stella* tows the aeroplane (a
three-seater de Havilland Fox Moth)
to an ice-free expanse of water,
where it can take off. Stephenson
stands on one of the floats ready to
prevent them from colliding with
chunks of ice.

Launcelet Fleming

In winter and spring when the plane,
fitted with skis, could take off from
the sea-ice, she was able to carry a
larger load of cargo than when she
was fitted with floats. Consequently,
at this season of the year it was
possible to lay out quite large depots
of rations for sledge journeys by
making successive flights from the base.

E. W. Bingham



When the plane is towed out, a man sits precariously on one float to kick away pieces of floating ice. The other float follows in the wake of the motor boat.

Colin Bertram



Under the ice cliffs of the Argentine Islands. The plane swings round after crossing the tide crack on to the frozen surface of Stella Creek. In order to prevent damage by bumping, the tail skid is tied to a sledge. At the mouth of the creek there was a smooth expanse of sea-ice from which the plane could take off.

Brian Roberts

Bertram and Hampton shackling the plane to the draw cable, which led up the slipway to a winch at the back of the hangar. Rymill, the leader, is on the right with Stephenson.

Launcelot Fleming



The plane, kept in check by a cable connected with a winch at the back of the hangar, moves slowly down her slipway into the water and two men remove the wheels. Note the Ringed penguin painted on the tail.

Launcelot Fleming

100 miles from the base. There was only one place where there might be a gap separating Graham Land from this wide extent of mountain country. Here was a discovery of the greatest importance. At last the expedition was within striking distance of completely unknown territory — and already a significant change had been made in the map.

Meanwhile there was not an idle moment for any of the nine men left on shore for many weeks to come. Until their new home was built, the men lived in tents on the beach and experienced a foretaste of the strength and persistence of the winds that this region could provide. For reasons of design and immediate expediency it was deemed wisest to anchor the plane head to wind until the hangar was completed, but as the wind velocity rose far above the flying speed of the machine, sacks of coal, large stones and anchors had to be attached to keep her lashed to the ground. As in the previous autumn, a supply of seal meat had to be secured before the sea froze over and the Crabeater seals left the coast. It was so far south that there were many fewer seals and much longer distances had to be covered in the small motor launch to find them.

Essential as was the meat supply, an early freeze up was eagerly awaited. Disappointments of the previous year had produced a state of mind such that no member of the party was going to believe that there would be any sea-ice on which to sledge until he saw it. Happily, suspense was soon eased, for toward the end of April a fast sheet of ice had formed all round the islands, of sufficient extent and

thickness to justify beaching the boats for the winter and taking dog-teams out for training. At first the ice was like a skating rink, and there was a hint of inebriety about the drivers and their pupils. A single fall of snow was enough to afford a better grip and the sea-ice lost its crystal brilliance.

By the end of May there was ice for miles around and a start could be made laying depots to the south for the long spring journeys. Midwinter in Antarctica is not the time that one would choose for sledging, but bad luck the previous season was a powerful spur to abnormal activities. On June 11th a party set out with the intention of placing a large depot of man and dog food on the near edge of the shelf-ice some seventy miles south. At this time there was light enough for sledging only between the hours of ten and two each day, so that, even in the best of weathers, the advance was very slow. The first day out was a severe test, and Moore became so badly frost-bitten that he had to return the following day. Five teams of ten dogs, each hauling a sledge carrying more than half a ton, and the tractor, which was pulling two more sledges, continued south. The sea-ice was young, hummocks were plentiful, the surface was often salty, and travel was very slow. When camp was made on the early afternoon of June 17th, a week after the party had left the base, only twenty-five miles had been put behind them. They were hopeful of making better speed next day, since the surface had been improving and the weather remained calm. A few hours later, however, a wind sprang up which by morning had assumed such a force that travel was out of the question and the men had to stay in their sleeping bags. It was impossible to lie at ease with untroubled mind, for the wind was blowing off shore, and only a few miles of thin sea-ice lay between their camp and the open ocean.

Soon after noon the men pulled on their windproofs and sealskin boots, and went out to feed their dogs, each with its one-pound cake of pemmican; but the blizzard had attained such violence that the first blocks of pemmican to be taken out of the cases simply vanished down wind, and the dogs, tight-curling against the drifting particles of ice, were left undisturbed. All hands then set to work to make the tents more secure. Large blocks of ice, hacked from the surrounding hummocks, and all the available ration boxes were piled on

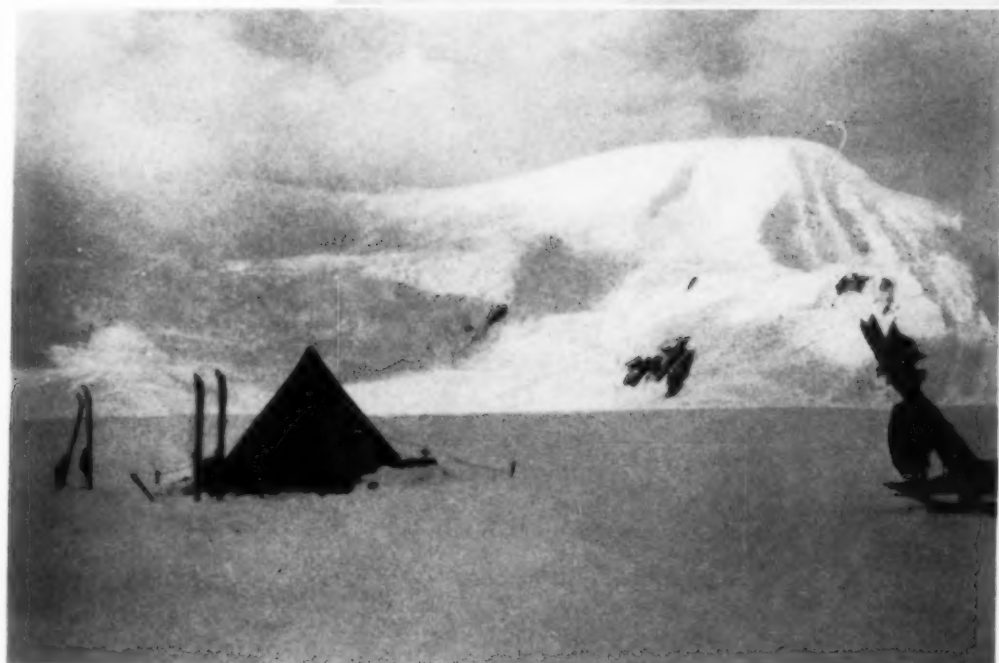
From leadership to motherhood. Lamb was leader of Bertram's team throughout the southern journey. A few weeks later, with equal success, she gave a demonstration of what she could do in the way of tight stowage — there are four more hidden at the back!

Colin Bertram



The camp by Spiral Glacier in King George VI Sound. At this camp were collected the first fossils ever to be found west of the southern part of the main Andean fold system that runs down the whole length of the Americas and continues into Graham Land.

Colin Bertram



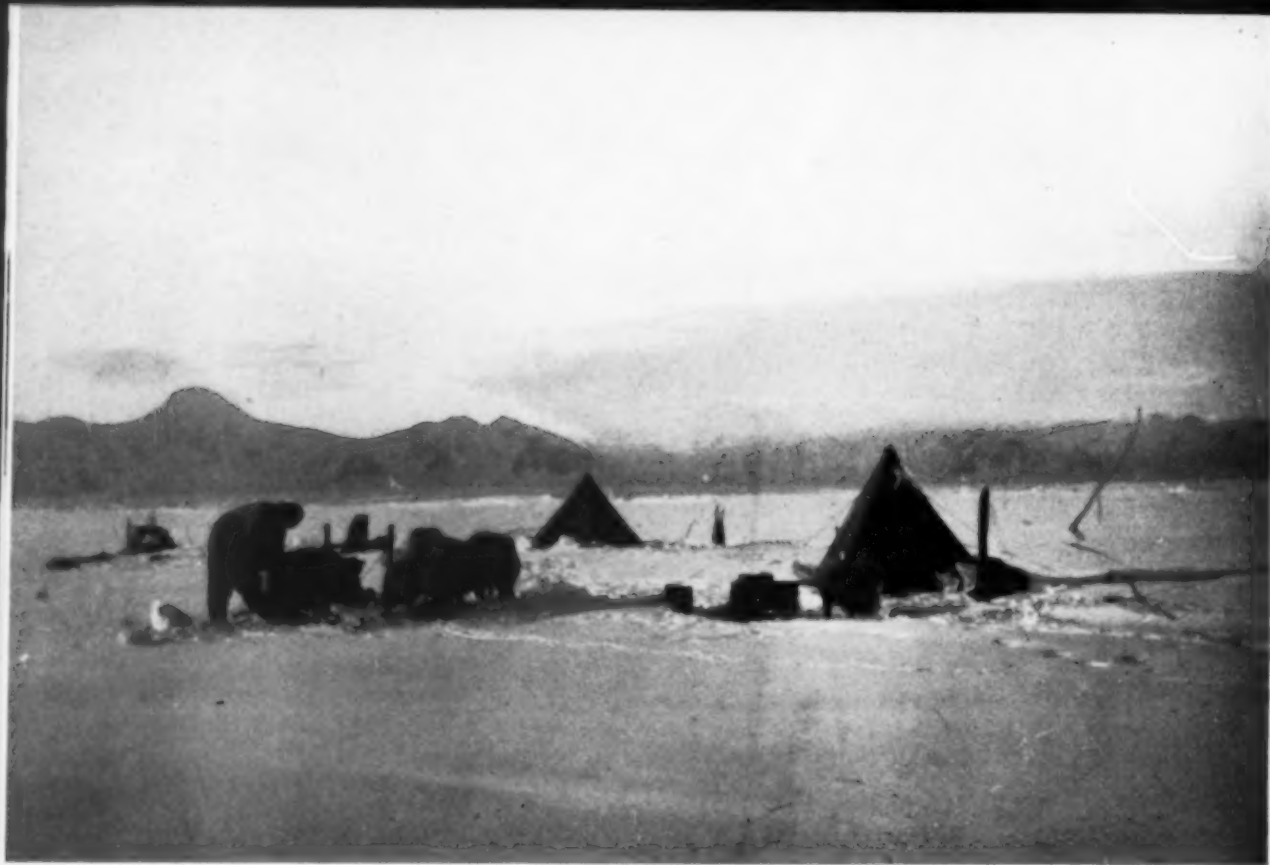
Mount Peary — in southern Graham land named by Jean Charcot after the great explorer of the North.

Launcelot Fleming

Bertram's team at a camp during the descent to King George VI Sound. This team was in the lead throughout the long southern sledge journey. Most of these dogs were born in the Antarctic. Lamb, the leader, is on the extreme right.

Colin Bertram





The morning after. Bertram starts to dig out his sled after a night of drift on the Wordie shelf-ice.

Launcelot Fleming

A team brings back a seal. The expedition, men and dogs together, used 550 seals, a total of about 100 tons of meat.

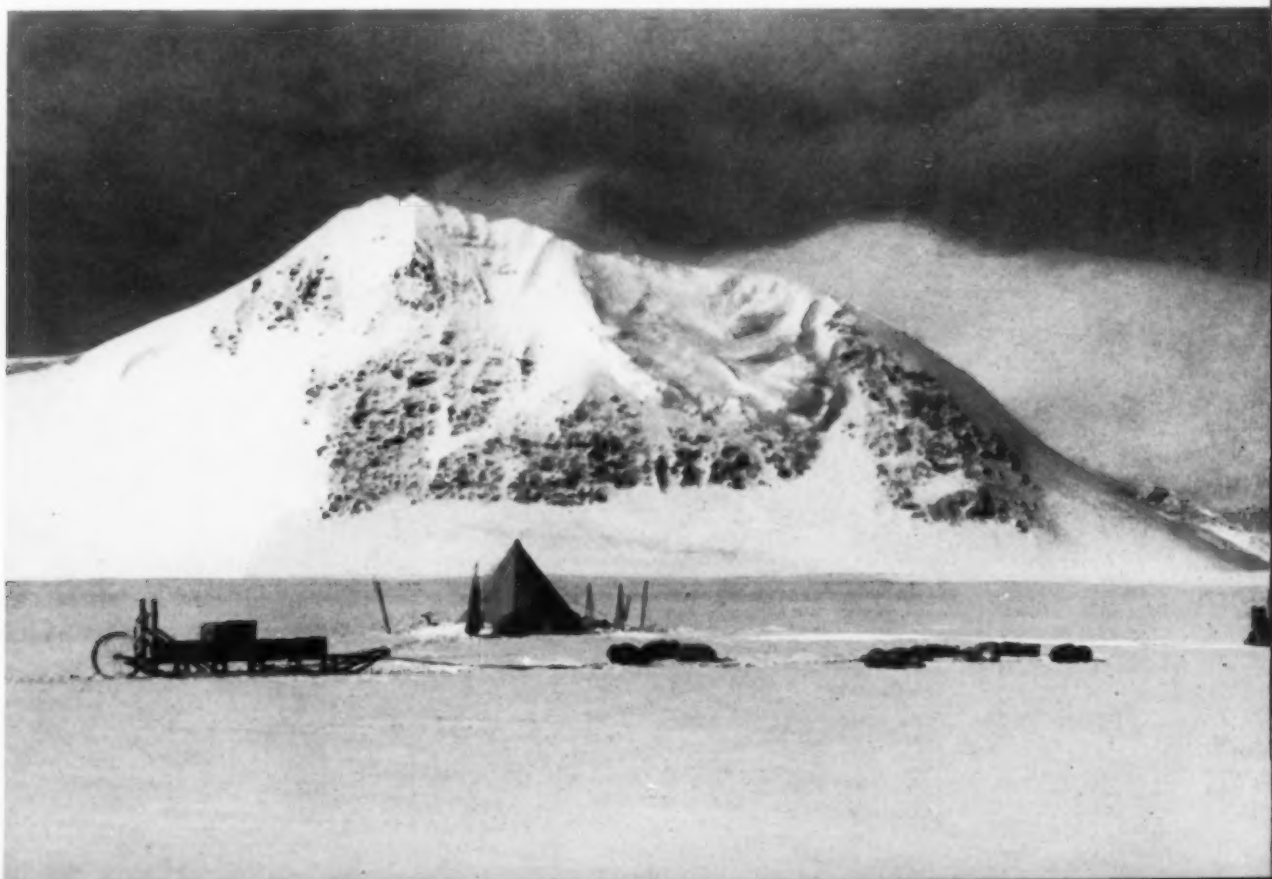
R. E. D. Ryder





A halt on the sea-ice off Cape Tuxen. The sea-ice in this region was constantly broken by powerful winds and water movements, so that travel across it was only possible for a short period soon after midwinter. Colin Bertram

"Rest at last". The dogs lie curled up asleep after a long day of up-hill pulling across southern Graham Land in the course of Rymill's and Bingham's journey to the east. E. W. Bingham



the tent skirting. This took several hours, because the entire operation had to be carried out crawling on hands and knees, clinging to whatever irregularities the ground provided. Such precautions were not enough and once back in the tents with the wind rising to still more diabolical heights of fury, and the tent walls whipping and tugging at every gust, each man had to wedge himself as a human buttress to support the upwind corners of his home. The ice was undoubtedly too thin to resist these forces altogether — and the question was simply as to the extent to which it would be broken, and whether it would shift out to sea taking this human cargo as its victims. All this was realized, and the men got ready for a hasty move, packing everything together save the tents and sleeping bags. Then, as the hours of darkness passed, dull knocks and jars were felt beneath the ice, insidious in their repetition rather than in their violence. By great good fortune the wind slackened, but the shocks and jars increased. At 3 a.m. investigations were made with a lantern, and the immediate danger was soon apparent. The ice was broken within six feet of every tent; one team of dogs was on a piece of ice separated from the sledge by a lane of open water, but the tents themselves and all the sledges were as yet on the same floe, about half an acre in extent. A look-out was set, each man patrolling the little estate with a hurricane lantern for an hour in turn, watching whether fresh cracks appeared or other dangers were at hand. By 9.30 a.m. it was just possible to make out the general surroundings and to realize how fortune had favoured the party. All around were leads of open water, pressure ridges and small ice-pans. The only floe of any size appeared to be that on which the tents were pitched. A glance was enough to show that only one course was open. All the depot stores were piled in heaps beside the tractor, marked with lofty bamboo poles and abandoned. Then, with man and dog food for ten days only, the men set about extricating themselves and their teams as best they could.

There was a small group of islands four miles away to the south, and toward them the course was aimed. Only a bird could have travelled straight to the islands, for the tangle of leads and pressure ridges, pools and floes, prevented all direct sledge travel. Pinnacles and hummocks had to be climbed to spy out the best route; more

and more the course had to be turned to the east in an attempt to circle round and gain the islands. All speed was necessary, for though now calm, the wind might rise again at any moment. The struggle proceeded through the few hours of dusky twilight round midday, and continued far on into the dark. Rymill, as a scout ahead, led the way by the dim beam of an electric torch. Hampton, Stephenson, Bingham, Riley and Bertram followed as best they could, each with a team. The sledges were now very lightly laden, but they turned over countless times, or became jammed in the tumbled ice. The men were soaked to the waist or neck by ice-cold water, through frequent slips into cracks or leads. Finally, at 7.00 p.m., after five hours' travel in darkness, the islands were reached. The dogs swam or were flung across the open tide crack, and then they dragged the sledges and men through the water on to the steep slopes of what was now named Terra Firma Island. As the last man left the sea-ice, he shouted with a satisfied air of achievement, "Well this can't blow away", to which came the reply, "No, but it may be a volcano!"

Once ashore, the party at once put itself and the dogs on to half rations to eke out the meagre supplies that it had been possible to drag those last few miles across the shifting ice. There they waited for over a week, until once more the sea-ice seemed sound and they could make for home. Meiklejohn, Moore and Fleming, who had stayed at the base, were profoundly relieved to see them back, for after the blizzard had spent its force, the expanse of open water which they could see in the direction to which the sledges had so recently set out, had made them very anxious.

It certainly was an ill wind that did no one any good — the midwinter journey had been abortive — a tractor and two tons of stores were lost, and the only route south was now impassable. It was necessary to wait for fresh falls of snow and winds to smooth out the tumbled sea-ice before heavily loaded sledges could once more attempt the southward trail. On the other hand, a great fjord system to the north, still quite unknown, was easily accessible, and it was in this direction that the next exploring parties turned.

Two parties set out together to map this region and were away from the base for a little less than a month. Rymill and Bertram took the more northern area;

Stephenson, Fleming and Riley, the southern. In the steep-sided fjords, the ice, which had been protected from the recent violent winds, formed a smooth and unbroken surface for miles on end. Despite the cold, this period of intensive mapping proved to be exhilarating. The sun was just returning after the long winter darkness, dogs were fresh and well used to the work, surfaces were good, loads were relatively small and rations ample. All went well and much good work was done. Rymill and Bertram had one strange experience. When they were travelling over what they knew to be extremely thin sea-ice, they were dumbfounded, on looking back, to see a seal swimming along behind the sledges, at intervals thrusting its head upward through the ice between their tracks.

By the time the northern survey had been completed, the ice south of the base had become sufficiently smooth, after the midwinter break-up, to allow the transport of the heavy loads for the main effort south. By this time too, with returning hours of light, further flights had been made southwards to examine the lands discovered in the autumn. It was found that Graham Land and Alexander I Land were not in fact joined by high mountains as at first sight seemed possible, but were separated by a narrow and deep fjord or sound, which led southwards for an unknown distance. This was clearly the gateway for exploration, and two sledge parties set out to penetrate and map the region. The original plan was for the



(1) A critical moment of the day. The alarm has just gone and Stephenson unties the door and looks out to see if the weather is good enough for travelling. This picture was taken during the return journey of Stephenson, Bertram and Fleming along King George VI Sound, when bad weather frequently delayed the party and forced them to reduce their rations.

Launcelot Fleming

(2) Rest at the lunch halt. Bertram and Stephenson with a thermos flask of water.

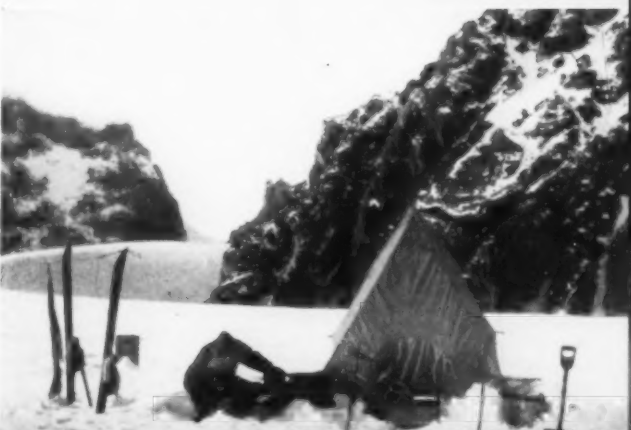
Colin Bertram

(3) Stephenson at work on a plane-table survey. For this chilly detailed work, he wears three pairs of finger gloves, silk, wool and chamois leather.

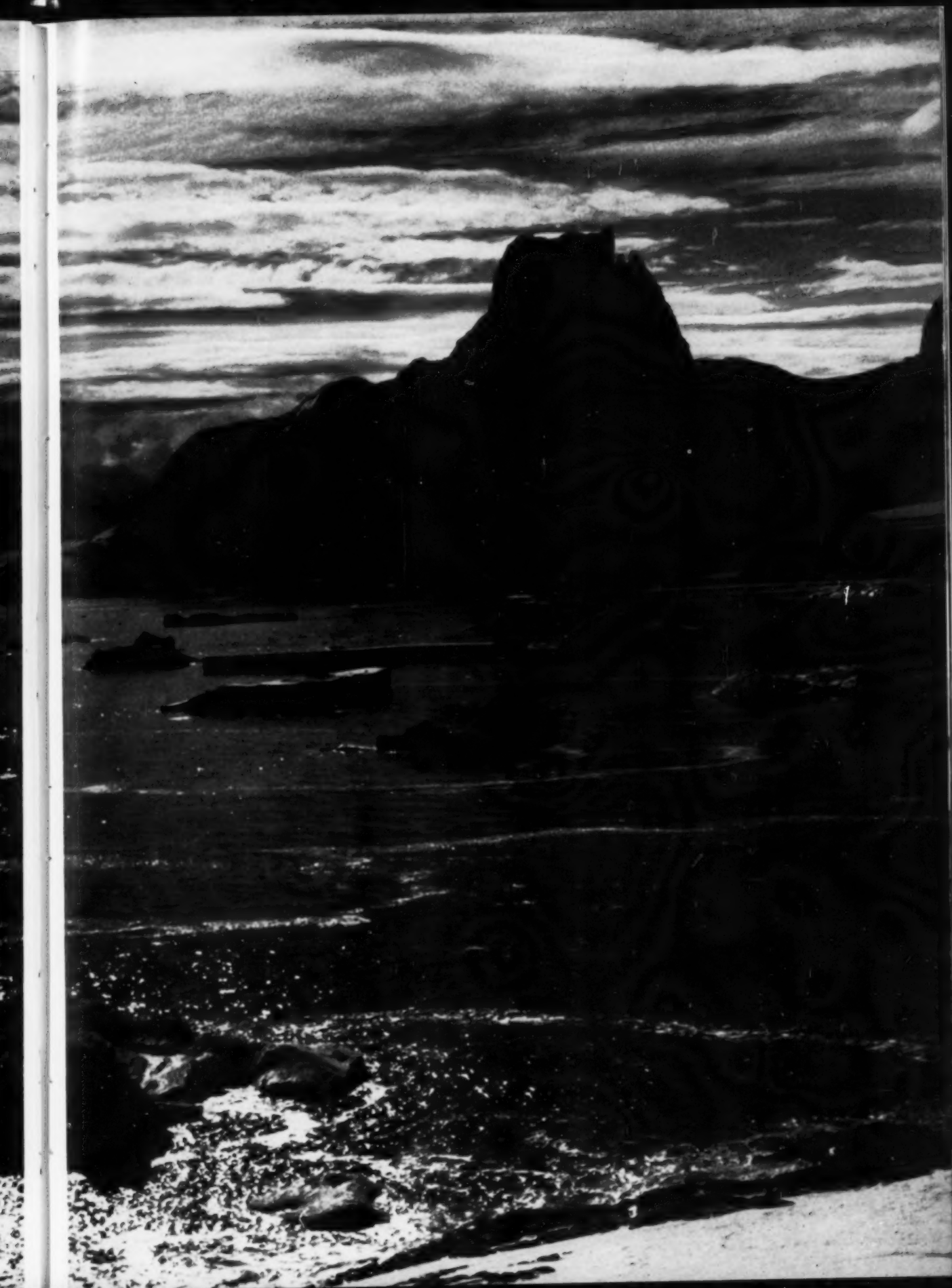
W. E. Hampton

(4) Stephenson uses the wireless time-signal set to check the watch he is using for his survey work. The aerial is stretched between skis standing upright in the snow. Accurate mapping of the country was a main objective of all the journeys.

Colin Bertram









One of the largest penguin rookeries in the world, at Deception Island, a dying volcano off the north-west coast of Graham Land. Roberts planned to count the number of penguins at each rookery, but here he had his job cut out! The estimated population of this rookery amounts to about 145,000 penguins.

Brian Roberts



parties to travel in company. Then Rymill and Bingham would turn to the westward and attempt to reach Charcot Land, while Stephenson, Fleming and Bertram would follow the mainland coast and make toward the east, as circumstances allowed.

At 11 a.m. on September 5th the five men started with fifty dogs and a total load of 6,000 pounds of man food, dog food and equipment (tents, sleeping bags, theodolites, wireless time-signal sets, etc.). From the very first it was heavy going, and the dogs ploughing shoulder high in deep soft snow could not pull more than half their loads at a time. After eighty miles over sea-ice, the route lay across a crescent of shelf-ice filling the back of a large bay, and then up a glacier to a col at about 2,500 feet, before descending to the sound beyond. It was at the passage of the margin of the shelf-ice that the first real difficulties arose. In good weather all would have been easy. But the sky was uniformly overcast, and day succeeded day of that queer false half light, so well known to the polar traveller, when all contrasts

A Gentoo penguin with her young. Two eggs are laid in each nest and as a rule both eggs are successfully hatched.

Brian Roberts



A King penguin "crèche" at South Georgia. The young are covered with a thick racoon-like down which makes them appear larger than their more handsome elders. The chicks are bunched together and a few adults stay to look after them, while all the others go off to sea to collect food.

Brian Roberts

are obliterated, ice and sky merge in one, and hollow and hummock are indistinguishable. Under these circumstances, forcing a passage through the maze of rifts and watery cracks at the edge of the shelf-ice was quite impossible. For eight days on end the men were forced to lie idle, railing at the fate that kept them tied. On the fifth day there was a barely perceptible improvement in the visibility and an attempt was made to move. It was like playing American football — after twelve hours' work the party had made a hundred yards! Patience was finally rewarded. On the ninth day nearly twenty miles were covered and the hinder part of the crescent of shelf-ice was reached.

At this point Rymill changed the plans. Those eight days of 'lying up' had meant the eating of eight days' rations, and the first three weeks of effort had resulted in only ninety miles of progress. It was decided, therefore, that Rymill and Bingham should hand over to the other party whatever food they needed, so that Ste-

Colin Bertram holding an Adélie penguin. There is no question that it would much sooner not have his kindly society, but an Adélie penguin does not register his dislike for humanity with anything more than an occasional peck.

J. I. Moore





Meiklejohn collecting eggs at an Adélie penguin rookery some ten miles south of the expedition's southern base. Penguins' eggs are delicious. Approximately 1,200 eggs were collected from this rookery. Those which were not cooked within a few days of being collected were preserved in flour and thus kept fresh for several months. W. E. Hampton

An Adélie penguin turns its egg.

J. I. Moore





Rockhopper penguins, lively, opinionated and often cantankerous, breed in long tussock grass of sub-Antarctic Islands and are found as far north as the Falkland Islands, where this photograph was taken.

Brian Roberts

Inset: — A Rockhopper penguin faces the camera man. The provocative appearance of this bird gives a very fair idea of its character. Rockhopper penguins are perhaps the most refractory of all the penguins, and take an unwholesome delight in pecking the hands or legs of inquisitive scientists.

Brian Roberts

A group of Adélie penguins with their young. The chicks show few of the alluring and playful qualities which one associates with the very young.

E. W. Bingham





Lamb was Bertram's leader. Throughout the long southern journey she was leading dog of the leading team. Her courage, sagacity and ability to keep on a straight course did much for the success of the journey.

Colin Bertram

Lower right:—Stephenson and his team follow in the tracks of the leading sledge. Fleming's team, a few hundred yards behind, appears as a speck showing above Stephenson's head. This picture was taken on the smooth surface of the shelf-ice which fills King George VI Sound. Sledge runners and dogs only sank in an inch or two on a firm surface that enabled the party to travel over twenty miles a day.

Colin Bertram

Below:—A Weddell seal lying contentedly asleep on the sea-ice in the Antarctic sunshine.

Colin Bertram

phenson, Fleming and Bertram could continue on their way revictualled for a maximum radius of action. Meanwhile, Rymill and Bingham, with light sledges, would return to the base at best possible speed, load up and set out again. So, on September 24th the two parties separated. Three men on their way south toiled slowly up toward the col; two sped down the old sledge track for home.

The three-man party still had to contend with exasperating days of overcast skies and dull half light. Among the crevasses of great glaciers such conditions were especially trying. Many expedients were attempted in order to increase the pace at which the icy maze could be threaded. The best was for one man to ski in front with a dog whip and use its lash as an antenna to explore the ground ahead. The darkness of the leather was clearly visible when the surface on which it lay was not. The presence of an ice hummock only a few feet ahead was known by the lash appearing to rise suddenly into the air, and a crevasse or rift by its shortening as the end hung downward out of sight. Even so cautious a means of progress could engender a false sense of security. On one occasion Bertram was making a reconnaissance in this way, when it occurred to him to flick his whip, not, as he had been doing, ahead, but to one side, when to his astonishment all save the nearest five feet disappeared. He then turned and sent the lash to the other side with precisely the same result. He had, in fact, been advancing along the axis of a narrowing wall of ice lying between two deep chasms. A few paces to one or the other side must have ended in disaster.

At last, on October 3rd, the col was crossed and the sound, which led south between Graham Land and the newly discovered mountains which formed part of Alexander I Land was reached. The sound proved to be floored by shelf-ice—that is to say, floating ice, which had



THREE ANTARCTIC YEARS

accumulated to a great thickness during many years of falling snow. When the party joined it, the shelf-ice was broken by great rifts, but later travel was more rapid, and a day or two of absolutely clear weather at last enabled the men to appreciate their surroundings properly. The sound ran slightly east of south. Its floor was a gently undulating plain of shelf-ice, rising at a scarcely perceptible gradient to the south. On the west the high mountain cliffs of Alexander I Land rose in a series of great scalloped corries to an 8,000-foot ridge. To the east were narrow rocky ridges rising to join the high mainland plateau of the interior and separated from each other by great expanses of glacier ice spilling into the sound. The sound was only fifteen miles wide, but the height and steepness of the mountains on either side made it seem far more like a fjord than a bay. The extraordinary thing was that, as one day's travel followed another, the sound was seen to extend many scores of miles south with little variation either in direction or width. So intrigued were the party by this unique feature, that they were tempted to press on beyond the date when, according to the amount of food that was left, they should have turned for home. They did not need to flout safety for long, because on October 19th, they at last reached a place from

which they could see the southern end of this immense sound swinging west to widen into a vast bay. This was by far the most southerly point which had been reached by a sledge party in the west Antarctic. So clear was the atmosphere when camp was pitched, that all was visible in detail for at least sixty miles around.

Next morning they started home. Incidentally, this proved to be the first and last time in the whole journey of

Right:—Rymill and Bingham on their return from a sledge journey lasting seventy-two days. The beards were removed immediately the photographer's designs had been satisfied.

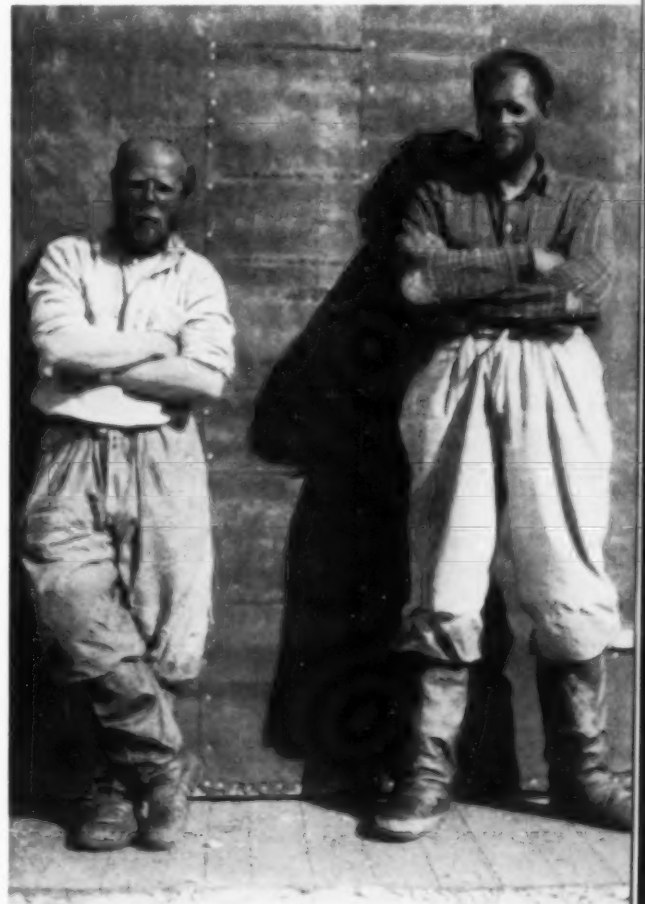
Launcelot Fleming

Lower right:—The second-in-command with a look of domestic splendour sews tapes to the cuffs of his wolfskin mitts.

Brian Roberts

Below:—The doctor enjoying the comfort and warmth of his bunk. Pipes, books and 'housewife' are all easily accessible; and the lids of chocolate boxes are used as decoration!

Brian Roberts





These young shags will soon assume the handsome plumage of the parent birds alongside. The feet of shags much resemble begonia leaves in their shape and pinkness. Shags always nest at the edge of a high cliff overlooking the sea in order to give themselves a good take-off for flight.

Brian Roberts



Silver Grey petrels at Clarence Island. They gently rub bills together as part of their courtship.

Brian Roberts



The ornithologist has lifted this Wilson's petrel chick, a few days old, from its nest burrow in the moss. Should the entrance to the burrow become blocked by snow, the chick waits patiently, living on its fat for many days, until at last the parent can bring food again.



Brian Roberts

Bottom left:—A dainty tuft of dove-grey lichen growing in a cranny in the rocks. Mosses and lichens are the only plants that manage to survive the harsh climate of Antarctica.

Brian Roberts

Below:—The ornithologist has made a hole in the roof of a burrow in the moss. When the egg has hatched and the chick is fledged, this Wilson's petrel will flit about the stormy seas of the South and North Atlantic before returning nine months later to the selfsame mate and burrow. The bird was ringed to prove this truth.

Brian Roberts



A disconsolate shag surveys her empty nest. Her eggs have proved too tempting to a hungry man.

Brian Roberts



A skua senses danger. A few seconds later she defended her nest from the air, circling above the intruder and swooping down to peck at his head.

Brian Roberts



A Ringed penguin sitting on her nest, which consists simply of a collection of small stones. During the period of incubation, which lasts thirty-eight days, the parents take turns to sit on the eggs.

Brian Roberts ➡

Bottom right:—The modern craze for bodily comfort has even penetrated to Antarctica. A Cape pigeon (a kind of petrel) finds it more restful to sit alongside her egg instead of incubating it.

Brian Roberts



Below:—Cape pigeons. These dainty piebald petrels pick particles of food from the galley refuse bin emptied overboard.

R. E. D. Ryder





seventy-four days that conditions allowed travel on four consecutive days. A good deal more than half the total food had now been eaten, and rations were already reduced. There was no reason to suppose that the homeward rate of travel would be much faster, and some days were required to fill in more detail in the survey. Furthermore it had been decided that two days must be spent doing geological work on the lower slopes of Alexander I Land. On the outward trail from the Graham Land side of the sound it could be seen that the rocky bluffs of Alexander I Land differed completely from any formations which had yet been seen during the expedition, in that they consisted of stratified rocks. The geologist had prophesied, a year before, that if sedimentary rocks were to be found at all, they would most likely be found to the west or east of Graham Land itself. Now here they were, and excitement was intense. On the finding of fossils in these rocks depended an important part of the interpretation of the long history of earth changes that have built up Graham Land and given it its present form.

On October 23rd the first fossils were found; some incomplete bivalve shells, a few fragments of primitive plants and a shark's tooth. At the time when these were incorporated in the muddy deposits which had preserved them, southern Alexander I Land had evidently enjoyed a much warmer climate, perhaps of sub-tropical character, but that was in the Jurassic period, many million years ago.

After this discovery, Stephenson, Fleming and Bertram made what speed they could toward home. Again there were many days of troublesome half light and these conditions appeared to coincide precisely with the times when crevasses and rifts had to be negotiated. More days were wasted 'lying up' in the tents, rations were still further reduced, and the men began to feel the cold more keenly. An empty stomach is a remarkably effective spur to progress. But the need for extreme caution on overcast days was well impressed on Stephenson and Bertram. On one such day ski-ing side by side across what they thought was the bottom of a rift, they descended thirty feet under the acceleration of gravity and, still side by side, but head downwards, knew that they had been

Top:—A new-born sea elephant pup takes his first look at the home rookery on a South Georgia beach.

Brian Roberts

Left:—A sea monster, twenty feet long, leers at the approach of man. His proboscis is inflated with mounting rage — hence the name of elephant seal.

Brian Roberts

mistaken. The snow was soft, their necks were tough, and no harm was done.

A few days later a solitary penguin was met, heading for the South Pole. If the nearest rookery was its real intent, instinct had proved a sorry guide, for the bird had already waddled at least forty miles in the wrong direction to meet a swift, if undeserved fate from three teams of hungry dogs.

On November 11th, near the top of the col which the party had crossed on their outward journey, Bertram, in the lead, saw some moving specks in the distance and was beginning to wonder whether these might be more nomadic penguins, when he realized they were two men with their sledges and dog-teams. They were Rymill and Bingham who had been back to the base and had started out again with fresh supplies. The two parties camped together for the night to exchange notes. Stephenson, Bertram and Fleming then had an uneventful, if somewhat hungry, journey back to the base. Rymill and Bingham went on — turning their course to the east to cross the divide of Graham Land and try to reach its eastern side overlooking the Weddell Sea.

On this journey, which lasted seventy-two days in all, Rymill and Bingham had to surmount conditions which were very different from those encountered in the sound. First they had to climb up to 8,000 feet through a pass with mountains of 10,000 feet on either hand. For them there was no travel on a straight course, but a continual twisting and turning between mountains and across heavily crevassed glaciers. Even when they reached the break of land, and the apparent south-western margin of the Weddell Sea, they did not have the satisfaction of absolute conviction, because during the entire month that they looked eastwards there was a sea of cloud before them. Rising and falling some hundreds of feet, retreating and advancing some hundreds of yards, it was always there, and prevented any really extensive views as a reward for their labours. Eventually, diminishing food supplies forced them to leave the east and turn toward

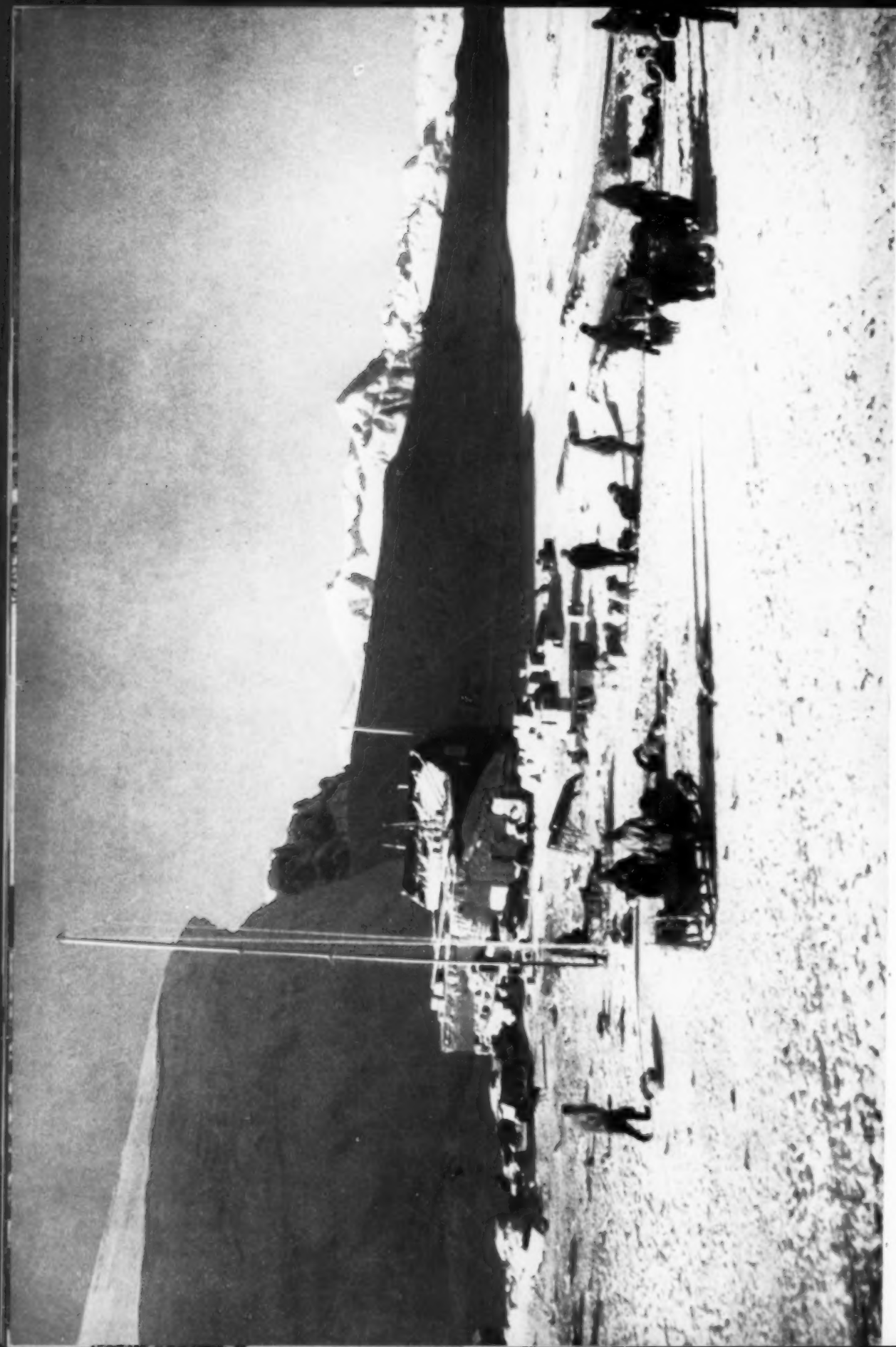
Top:—A harem bull sea elephant lies exhausted from his constant fighting with the bachelor bulls. Notice the scars on his neck from the teeth of his opponents. Some of his cows and their pups are seen beyond.

Brian Roberts

Centre:—South Georgia's crowded beaches. Sea elephants litter the foreshore. They lie in groups or harems, each dominated by an adult bull. A fully grown bull is twenty feet long and five times as massive as a sea elephant cow.

Brian Roberts





The start of a spring sledge journey. The party have been up early and now they are almost ready to start. The doctor has taken the precaution of tying his sledge to the wireless mast in view of the strength and boisterous spirits of his team. Five minutes later the party will be off—the dogs running at top speed over the drop at the tide crack on to the smoother surface of the sea-ice. Within half an hour they will settle down to a steadier pace.

Brian Roberts

home. Midsummer had now come, and, travelling by night on crusted surfaces, their return was rapid. In fact, this was a most fortunate circumstance, for the last stretch of sea-ice that they had to cover was fast rotting and if they had not crossed it in time, they would have had to wait perhaps many weeks on the coast before they could have been relieved by boat. With this risk in mind, caches of food had been left at Terra Firma and other small islands. But good fortune favoured them, and Rymill and Bingham, seeming almost to sledge across the water, reached the Debenham Islands after this first crossing of Graham Land, just three days before the ice was blown out to sea.

So was completed the last sledge journey of the expedition and the map of Graham Land was now very different from previous conjectures. The most interesting geographical results of the expedition were, first, that Graham Land is a peninsula and part of the Antarctic continent itself. This was a quite unexpected result, since Sir Hubert Wilkins, when he flew south from Deception Island following the east coast of Graham Land to latitude sixty-nine degrees south, believed that he saw several channels extending right across Graham Land to form a link between the Bellingshausen and Weddell Seas. In other words, he thought that Graham Land was an archipelago of islands. Secondly, Alexander Land was found to be an island extending more than 250 miles from north to south and lying to the west of Graham Land. And thirdly, Alexander I Land is separated on its eastern side from the Graham Land coast by one of the most impressive features of the earth's surface—a sound averaging fifteen miles in width and about 250 miles in length which is filled with shelf-ice and flanked by high mountain ranges. It was later found that this sound had been crossed, but not recognized as such, by Lincoln Ellsworth and Hollick Kenyon in the course of their magnificent transantarctic flight in the summer of 1936.

In addition, the expedition had carried out an ambitious programme of research—principally in meteorology, geology, glaciology and the biological sciences.

Whilst this work was in progress, *R. Y. Penola* had been voyaging the southern seas. After leaving the shore party at the Debenham Islands in March 1936, with seven men aboard, she sailed for Port Stanley. With a succession of following gales the Falkland Islands were reached in

twelve days. Some weeks later *Penola* sailed to Stromness in South Georgia. This was a voyage of great hardship for the men aboard. It was undertaken in the middle of winter, the crew was small, and successive gales with low temperatures much encumbered the ship with ice.

At South Georgia the ship's party carried out a complete refit, so that *Penola* might be ready for her work in the ice in the following season. She then sailed back to Port Stanley, but this time went farther northwards into warm waters to avoid the west wind belt. She left the Falklands again on December 29th to relieve the shore party. Touching at Deception Island, and then the Argentine Islands, she finally reached the Debenham Islands after weeks of contrary gales. Even then her troubles were not at an end. Coming in to the anchorage, despite all possible care, she grounded (by no means for the first time) on a rock unpleasantly close to the ice cliffs. This, with a falling tide, was a most precarious position, but it went once more to prove the value of a wooden ship for such work. Some hours later *Penola* was freed and dropped anchor opposite the base.

As if this were not trial enough, she was caught by one more gale, and the most violent of them all. For a full week the wind rushed down from the plateau, averaging more than ninety miles an hour, but with periods of much greater strength. (It was impossible to tell the exact strength of these powerful winds, because whenever the wind rose much above a hundred miles an hour, the cups of the anemometer were blown off their bearings). For seven days, communication between ship and base, only a hundred yards apart, was limited to signals. Fortunately, there was plenty of scope for mooring, two anchors at the bow, additional warps on both bows and on the quarters, and a stream chain and kedg amidships on the port beam. Even so, the ship's people had a long-drawn struggle to prevent *Penola* delivering herself to the shore party on their very door step.

During the storm the motor launch sank at her moorings, and one of the rowing boats was lifted by the wind over a low tongue of land and carried out to sea. Eventually, storm was succeeded by calm, and the ship was loaded for the last time. A store of coal and oil was left in the house, the windows were boarded up, the door was locked and the key nailed on the outside. On March 14th *Penola* put out to sea again, and this time she was 'homeward bound'.



GREENLAND, OUR NORTH-EASTERN NEIGHBOUR

by D. A. NICHOLS

INTEREST in Greenland has been suddenly accentuated because of its proximity to Canada. It is only about twelve miles distant from Canadian territory at its nearest approach across Robeson Channel at north-eastern Ellesmere Island, and hence lies more in the North American zone than in the European.

On account of its having been isolated from Denmark since the German occupation of that country, on which it was dependent economically, Canadian and United States officials have been placed in Greenland, and a Canadian vessel has taken supplies to the inhabitants and brought back Greenland products in exchange.

It is the largest island in the world next to Australia. Its length from north to south is about 1,650 miles, about the same distance as from Halifax to Winnipeg. Its greatest width is 800 miles or approximately the same as the distance from Ottawa to Duluth. Its area is about 800,000 square miles, nearly the same as the combined areas of Quebec and Ontario.

Owing to its geographical position, it became known to the early Norse sea rovers about a thousand years ago, and was partly explored and settled by them for a time, but, subsequently, was almost forgotten by Europeans. In the age of intensive discovery by navigators, its position in front of the North Polar regions of America caused it to be skirted by many of these adventurers seeking the Northwest Passage and access to the Polar Seas. Following this era of general exploration it again became accessible to European influences and to scientific explorations.

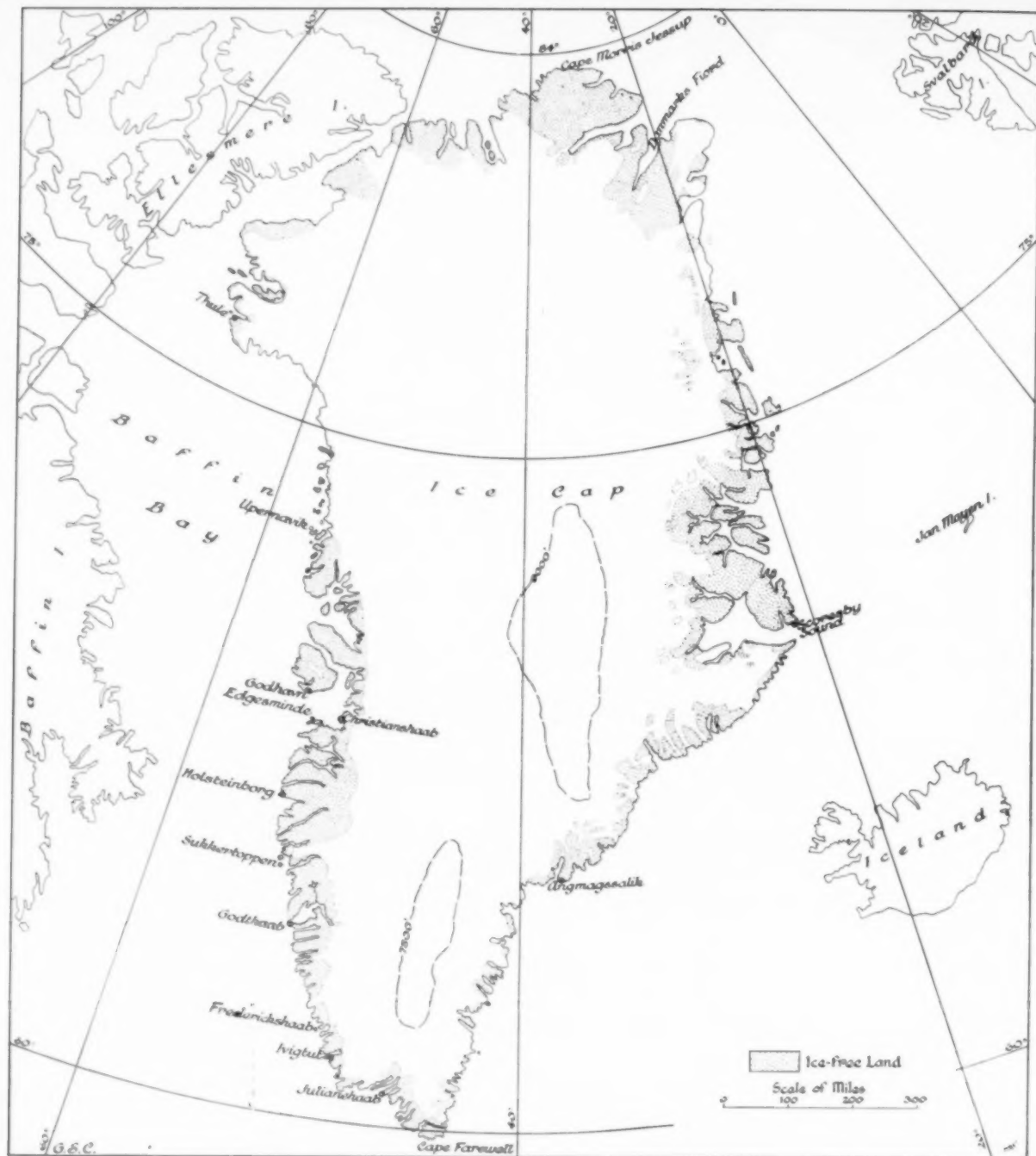
Iceland, lying east of the southern tip of Greenland, was known to European sailors long before Greenland was discovered, and a thriving population of European colonists was established there. It was one of these colonists who first discovered Greenland.

Eric Thorwaldson or Eric the Red, as he is generally known, was born in 955 of Norwegian parents. He had inherited an independent and roving disposition, and

had acquired a reputation as a brawler. One of his powerful neighbours in Iceland caused the murder of some of the servants of his father's household; Eric avenged this reproach on the honour of his family by killing the chieftain. On this account, and because he had also quarrelled with another powerful landowner who had stolen his family crest pillars, Eric was outlawed for three years and was forced to flee. He knew that a kinsman of his, Gunbioern, had discovered a continent far to the west, where he had been driven by fierce storms about a hundred years before this. Eric, with some hardy companions, set out in search of this land, intending to live out his outlawry there. This was about the year 982. He first sighted some barren, rocky islands, unsuitable for settlement. Proceeding farther, he coasted along the south-western part of Greenland and wintered at an agreeable island near a sound which he named after himself. The next year he examined portions of the mainland, and the third year he returned to Iceland. It is remarkable that during his three years of outlawry, 982-985, he and his companions examined more of the coast of Greenland than was seen in the two hundred years immediately after the reoccupation of the country.

Not only was Eric a good navigator and explorer, but he was also an enthusiastic realtor for, on his return to Iceland, his description of the land was so highly coloured that, as the old historian says, "He painted it out as such an excellent place for pasture, wood and fish, that next year (986) he was followed thither by twenty-five ships full of colonists who had furnished themselves richly with household goods and cattle of all sorts". Of the twenty-five ships that set sail, only fourteen arrived in Greenland. Some of the others were wrecked, others turned back to Iceland on account of the violent storms encountered. In the process of time, more colonists came from both Iceland and Norway to take up their abode in the new land, and established a republican government about 990. In the eleventh century the colonists were Christianized, and about

Left:—Greenland harbours are generally well protected by the lofty walls of the fjords. Fishing schooners are nearly always part of the scenery of the ports. Greenlanders own motor-boats such as seen here. They are encouraged to form partnerships to acquire these boats through a system of deferred payments.



MAP OF GREENLAND

Ninety-five per cent of Greenland is covered with a great ice-cap several thousand feet thick in places. Only the stippled areas on the map are free from ice.

1124 were placed under the bishopric of Nidaros, the present Trondhjem. The Chronicles relate that "they were summoned and told that for the honour of their country, and to follow the example of other nations, they must have a bishop of their own, and pay him a stipend. So that they sent a present of tusks and skins to Sigurd the King with a petition to grant

them a bishop." Arnold, a learned priest, was chosen, but he did not appreciate his appointment until he was assured that his stipend and church would be completely protected. On his voyage out from Norway, Arnold was wrecked and wintered in Iceland in the house of an old Icelandic writer, Saemund Frode, where "It is alleged as a token of his great humility and

GREENLAND, OUR NORTH-EASTERN NEIGHBOUR

condescension that he mended a poor woman's broken wool-comb".

The Greenlanders were so enthusiastically Christianized that the small number of settlers supported sixteen churches, a large cathedral and a still larger bishop's residence, the barns of the bishop's buildings containing stalls for one hundred cattle. Since there were only nineteen bays inhabited, with 190 villages of twelve parishes besides the bishop's seat and cloisters, it would seem that the colonists contributed nobly to the support of their spiritual advisers.

A line of more than seventeen bishops ruled in Greenland, but, as the colony decreased in prosperity, they had difficulty in maintaining their seats, the colonists being reported to have been so poor that they could not secure wine and bread for sacramental purposes, let alone contributing much toward the stipend of the bishop. Little is known of the later bishops, but, in the year 1408, it is related that Andrew was sent out to replace Bishop Henry, in case he was dead; the last bishop provided with a stipend was captured by the Lutherans and died in Denmark in 1537.

After existing for years as a free colony, Greenland became tributary to the kings of Norway in 1023, which was soon after they accepted Christianity. In 1256, in the reign of King Magnus, they attempted a revolt, but, with the assistance of the Danish King and a large fleet of ships, they were forced to make peace in 1261, and to promise a considerable tribute. This

records the first invasion of the western hemisphere by an armed fleet.

The colonists were dependent economically on Norway for their supplies of timber, iron and grain, and they paid their taxes and the cost of produce in trade goods consisting of ivory tusks and skins. During the thirteenth century, Norwegian commerce declined and finally ceased altogether about 1410. The colonists themselves apparently neglected navigation, for no trace of military organization either by land or sea has been recorded. The colony was soon lost sight of except by the church. Its position, however, was noted on the charts of Claudius Clavus, and sailing directions for reaching Greenland were preserved in the Icelandic manuscripts. Little was heard of the colony again until a Portuguese navigator sailed along its coasts which he called Terra Laboratoris. Later, it was sighted by Martin Frobisher, 1576, while on his third voyage in search of the Northwest Passage. In 1605, the Danes, animated by discoveries on the American continent, sent out an expedition in search of the lost colonists, but found only Eskimos occupying the land. As usual, with some of these early expeditions, some natives were taken back to Denmark as exhibits, but soon died of disease or loneliness, one poor fellow attempting to swim back to his

Settlement of Angmagssalik on the east coast of Greenland, established in 1894. Since the establishment of the trading post and mission, the population has increased considerably.





In places where the ice from the interior flows down to the coast, large pieces break off from the end of the glacier as it is pushed out into the sea. These pieces float away with the currents. When they reach the Atlantic sea-lanes, they form a menace to the northern transatlantic shipping.

native land. Several other expeditions were sent out, but ice prevented their getting near land, and some were captured by privateers so that these ventures ceased, and once again Greenland was buried in oblivion until about 1706, when Hans Egede became interested in the colony and a new period of colonization was started.

Egede was a clergyman. His conversation with a Danish friend, who was interested in whale fisheries toward the Greenland waters, aroused his sympathy in the poor inhabitants of the colony whom he supposed still resided there, and who had been so long away from contact with the church that they might, as he thought, have reverted to paganism. After several years of effort, much lobbying and considerable prayer, he persuaded the king to grant him a salary and appoint him pastor and missionary to the heathen. In May, 1721, he bravely set out with his wife and children and some trade goods, and, reaching Greenland on July 3rd in about latitude 64 degrees, he built a house on an island near Kangek, and began his missionary work. He had great difficulties with the Eskimos at first, but, after many years of patient labour, he won their

confidence. His trading activities, which he established as an aside from his spiritual labours, were carried on in the colony until 1774, when the Danish State created a trade monopoly.

When Egede found time to do some exploring, he could discover no trace of the old colonists except the ruins of their houses and churches; the whole coastal area, as far as he could find out, being inhabited by Eskimos who were not there when Eric the Red first landed in Greenland. The first record of the appearance of the Eskimos was in the time of the eleventh bishop, Alfo, who succeeded Jonas the Bald who was bishop in 1343. What the fate of the old colonists had been has never been solved. Egede supposed that perhaps they had been slaughtered by the incoming Eskimos or were absorbed by them. Perhaps their health was undermined by the lack of their accustomed European foods so that they weakened and died; perhaps the Black Death reached the colonists by contact with ships from Europe, and swept them all away, or it may have been a combination of all these factors. Anyway, no trace of the people themselves has been found.



Navigation along the coasts of Greenland is sometimes difficult. In cold weather the ships are often sheathed with ice.

Since Egede's time, explorers of various nationalities and missionaries have mapped the coasts of Greenland, amongst whom Kane, Hall, Nares and Scoresby were the earliest, with Peary, Mylius-Erichsen, Knud Rasmussen and Lauge Koch adding to their discoveries. Finally, the Danish Government instituted modern scientific mapping of the coastal regions.

Since 1774 Greenland has been a Danish Crown Colony. It is administered from Copenhagen by a Government Board, and, in the country, by various officials. Until the Great War, 1914-1918, only the west coast up to Upernivik and the east coast as far as Angmagssalik were recognized as being under the control of Denmark. In 1916, when Denmark ceded its West Indian possessions to the United States of America, the latter agreed to recognize the control of Denmark over the whole of Greenland. Norway did not agree to this, and protested against the control of the northern part of the east coast, where Norwegian fishermen and sealers operated. They had previously given up all claims to any part of west Greenland, and the Danes claimed that this renunciation included the whole of the island. They also maintained that the sealing operations of the Nor-

wegians cut off the supply of seals for the natives farther south. In 1922 colonization was begun by Norway at Myggbukten on the north-east coast, and a wireless and meteorological station was set up there. The Danes objected to this settlement. In 1924 the issue was temporarily adjusted by covenants which were to remain in force for twenty years (League of Nations Treaty, Vol. 27-1924, pp. 204-212). Sovereignty rights were left in abeyance, but both countries were to have free access to all parts of the east coast, with the exception of Angmagssalik. This proved satisfactory for a short time, but difficulties arose again in 1929 between two rival mining companies, and, when Norway raised its flag in 1931 and claimed Myggbukten in the name of King Haakon, the Danish Government laid its case before the Hague Permanent Court of International Justice. Next year, Norway claimed more land, which brought on war talk between the two nations. On November 21, the World Court began its hearings, and, in April 1933, gave to Denmark full title to all of Greenland, and invalidated that of Norway and the steps she had taken in occupying the eastern part. The Norwegian Government ac-

cepted the decision and ordered the end of its occupation on April 7.

This controversy had one good feature since it concentrated attention on the country and added stimulus to its exploration. Many scientific parties were sent out along the coasts and some to the interior. The Danish Geodetic Institute has thoroughly mapped the coast and has issued the results of its investigations in a series of excellent map sheets. The field work for these sheets was controlled by the most up-to-date methods, aerial mapping being used for filling in the detail. Over 200,000 square kilometers have been mapped, and photographs of 140,000 more were in hand for plotting in 1939. These published maps present a more vivid picture of the character of the country and its resources than that of any other area in the western hemisphere north of latitude 60 degrees, with the exception of parts of Alaska. Canada has few such maps in her northern regions, except of the areas around Great Bear and Great Slave Lakes and the mouth of the Mackenzie River.

About ninety-five per cent of Greenland is covered with a permanent ice-cap several thousands of feet thick in places. Only around its coastal fringe is there any ice-free land. Tongues of ice from the interior flow down to the sea through deep valleys. In other places, glaciers, many miles wide, reach the coast, and the ice, breaking off from these, forms the huge icebergs that float away toward the south with the Baffin and Labrador currents to form a menace to navigation along the Labrador coasts and Atlantic sea-lanes. In the interior, adjacent to the coasts, occasional rocky peaks project through the ice-cover to form "nunataks" which are so often referred to in connection with northern exploration.

The interior ice-cap of Greenland in places reaches to 10,000 feet in elevation, and is covered with loose snow which drifts about with the terrific gales prevalent there. The surface of the ice-cap is gently undulating and dips gradually seawards. Some of the glaciers moving down the valleys from the interior travel at a rate of 125 feet a day, varying their speed of movement with the seasons, generally moving faster in summer than in winter.

The coasts are exceedingly rugged and fringed with numerous islands, while an amazing number of bays and long fjords extend inland to the edge of the ice-cap or to the rocky land. On the western side

of Greenland, the mountainous ice-free terrain dips toward the ice-cap, but, on the eastern side, it rises toward it.

The rocks of the exposed areas are quite similar to those of the adjacent areas of Canada. There is a basement of the old Precambrian rocks on which are superposed strata of various ages. In Tertiary times Greenland had a warm climate with luxuriant vegetation, for we find fossil remains of poplars, oak, walnut, laurel, magnolias and ferns.

Surrounding the island is a shallow continental shelf across which deep depressions lead out from the ends of many of the fjords. These are taken to be old submerged river valleys carved by streams when the land stood several hundred feet higher than now. Baffin Bay, on the eastern side of Greenland is over 17,000 feet deep in places, and several such "deeps" lie on the eastern coast around Jan Mayen Island. There are two shallow areas about 1,800 feet deep connecting Greenland to Spitzbergen and Norway, and to Iceland, the Faroe Islands and Scotland, so that a comparatively slight uplift of the bottom of the ocean in these regions would make land connections to Europe. These shallow areas exercise a considerable influence on the oceanic currents crossing them. There is evidence that, since Glacial times, there have been several elevations and depressions of the land which have caused considerable climatic changes.

As a whole, the climate is uncertain ranging from bright sunny days to dense foggy weather, with heavy snowfall and severe winds. The January mean temperature at Ivigtut is 18° F.; at Upernivik it is -7° F. with a July temperature of 49° to 52°. The eastern temperatures are lower than those on the western side due to the great ice-pack which streams down the east coast from the Arctic Ocean and Greenland Sea. In the south-west, frost is rare in June, July and August, and the summers are fairly warm with long bright sunny days. Rain is heavy in the south-west, but is light elsewhere. The daily range of temperature is great on account of cold winds flowing down from the ice-cap. These cool winds, however, become compressed in the narrow valleys with consequent rise in temperature so that they become quite warm near the coast.

The plant life is Arctic in character, there being about 390 species of vascular plants, most of them being related to American types but some are European.

GREENLAND, OUR NORTH-EASTERN NEIGHBOUR

Vegetables are grown to supply local demand. At Umanak, broccoli and radishes grow well, and turnips and lettuce have a fair growth. In the south, around Julianhaab, parsley, rhubarb, turnips, lettuce and radishes are grown. Potatoes and carrots mature, if well cared for, but they are generally small. Cucumbers may be grown in frames.

There are no forests. The vegetation consists of mosses, lichens, willows, crowberries, birch and the usual Arctic flowers. In south Greenland, some dwarf, bushy birches and willows grow sometimes to twenty feet in height in well sheltered places, and the vegetation is less Arctic than farther north and more abundant.

The land animals consist of polar bear, musk-ox, lemming, wolf, fox, hare and ermine. The sea animals are seals, walrus and whales as well as sharks and several varieties of fish.

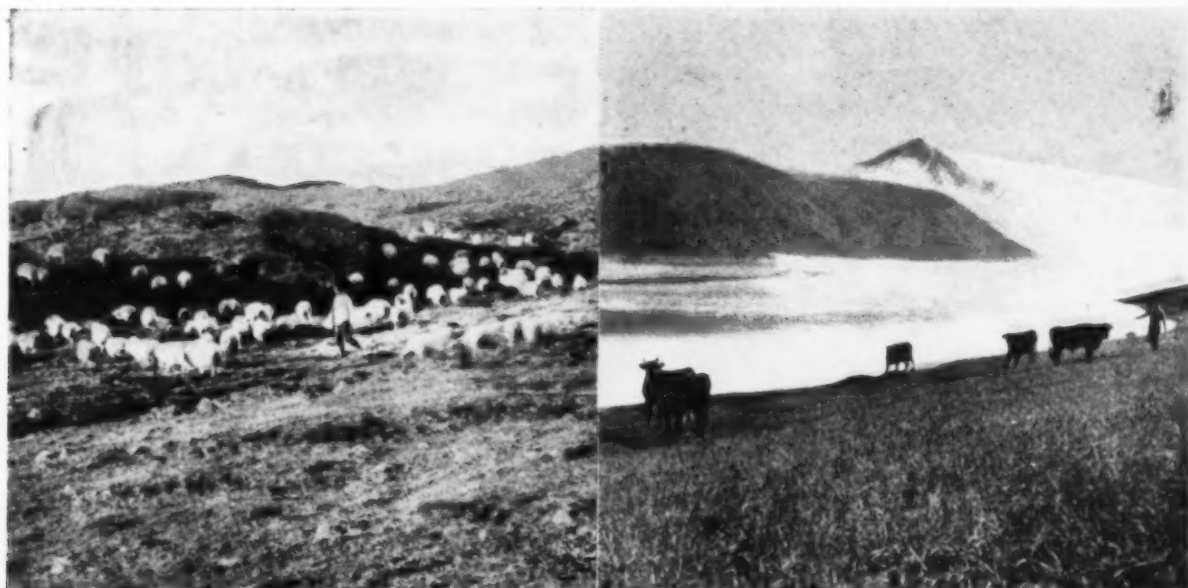
In the south, a few goats, sheep and cattle are raised. Formerly cattle were raised in large numbers, but grain as a food is now hopeless.

When Eric the Red went to Greenland in 982, he was apparently little troubled with ice. The old sagas show that ships went nearly due west from Iceland to the coasts of Greenland, then south along the coast and through the strait separating Cape Farewell Island from the mainland. This is now impossible due to the heavy southerly drift of the ice along the coast, yet the early sagas did not mention this hindrance. In the thirteenth century, however, there appears a warning not to make the east coast too soon on account of heavy ice, while, a little later, the old

course was abandoned and ships dared not try to reach the coast except at the southern tip of the island or a short distance north, where the ice was still comparatively scarce. This again points to a gradual change in the climate since the time of the earliest settlement. The Eskimos also reported that they had seen the ruins of the old Norse homes under the glacier ice which had advanced down the valleys and covered them. Other evidence points to the fact that many of the valleys were once free of ice and covered with vegetation. Cattle were more numerous in those days, having plenty of pasture. Now there are not more than a hundred in the colony.

The south-west coast of the island is most suitable for human occupation. The climate is milder and the currents bring in pack-ice, which means good sealing for the Greenlanders. Around Upernivik is a myriad of islands with no large fjords penetrating inland, but there are deep, broad, open bays, and the warm current coming up the coast reaches and moderates the climate there. Farther north, the climate becomes more severe, as the cold, south-flowing Robeson Channel current affects it. There are, however, isolated areas such as at Etah and in the wider bays where the east-west slopes of the ice-free areas have a more moderate climate, and considerable plant life exists. Walrus and seal are also abundant, and settlements exist in many places.

In the more fertile areas of south Greenland sheep raising is developing and is an important source of fresh meat. Formerly cattle were raised in considerable numbers but these are not so great now.





Until the present war, the affairs of Greenland were administered from Copenhagen by a Government Board, and, in the colony itself, by various officials. On the western side, the country is divided into Inspectorates, the boundary between the two being about latitude $67^{\circ} 40'$ north. The seats of the Government are at Godhaven and Godthaab. These Inspectorates were ruled by two Danish Inspectors who were responsible to the Director of Greenland in Copenhagen. Each Inspectorate is divided into Districts, of which there are thirteen. In each District the chief settlement is presided over by a Danish Factor, while the several outposts and hunting stations within the Districts are supervised by Greenlanders who are responsible to the Chief Factor of the District. There are about sixty-nine trading stations within the country, several of them having been in operation since 1880. The east coast settlements of Scoresby Sound and Angmagssalik are not under the Greenland Inspectorates.

Each of the thirteen Districts has its own council and a number of district officials. Before German occupation of Denmark, the main tribunal of the District consisted of the chairman of the District Council with two Dane and two Greenland Justices, who made a circuit of their district as circumstances required. Criminal cases were investigated and passed upon, but endorsement of the judgment had to be given by the representative of the Government in the province.

There are sixty-four communes within the Districts of Greenland, each commune having a local council elected by the adults of the community. The councils administer all funds belonging to their commune, expending it, on their own responsibility, for necessary relief. Every Greenlander of fifty-five years of age and over, if unable to provide for himself, is entitled to necessary relief.

All occupations are under the guidance of special branches of the Administrative Department. Expensive articles such as motor-boats are supplied on credit to industrious persons, and partnerships to obtain these are encouraged, a deferred payment plan being in operation. In connection with sheep raising, a certain number of sheep were given to interested persons, being paid for by return of a like number

Cryolite, used in the aluminum industry, is the chief mineral mined in Greenland. Of late years, marble is also quarried and shipped to European markets.



of lambs. This venture of the Government was an attempt to provide animals for meat in years when seals are scarce.

Mining is carried on to a limited extent. Cryolite, coal, graphite, copper and marble are found within Greenland. Cryolite which is rare elsewhere in the world, is mined at Ivigtut by a private company which pays sufficient royalties to the Government to assist greatly in the costs of administration of the country. Some 30,000 tons of this mineral have been shipped annually to Denmark and America for the manufacture of enamel and opal glass, for the aluminum industry and for providing a base for certain insecticides.

Coal occurs at several places and is dug by the Greenlanders themselves or purchased by them for fuel. One mine has produced 5,000 tons annually, all of it being used in Greenland. It is of a lignitic variety and burns with a steady heat, but has a high ash content.

The fishing industry is increasing. Salt fish, seal and codfish oil, shark oil, sealskins, eiderdown, ivory tusks and furs are also exported, bringing considerable revenue to the country. The stores are operated by the Government and provide textiles, hardware, fishing equipment and other goods. The prices are fixed so that absolute necessities are given preference over luxuries. Ships ply between the small stations and collect the seal and shark oil, skins, fish and furs, and other articles of barter. Low prices prevail for these products, but the European goods sold to the Greenlanders were at prime cost, and other supplies at prices that would scarcely pay for purchase and freight. On the average, no merchandise was charged more than twenty per cent on the cost price in Denmark. In addition to this, the Greenlanders were able to order goods from private dealers in Denmark by paying the freight and fixed rates. The price paid for European and native articles was fixed every year, the prices being printed in Danish and Eskimo and distributed by the Government. Out of the payment for goods, five-sixths was given the sellers and one-sixth was devoted to the Greenland public fund for works of charity and unforeseen contingencies. This

Top:—Shark fishing in summer.

Bottom:—Shark fishing through ice during the winter.

The growing scarcity of seals has gradually compelled the Greenlanders to turn to other natural resources, and now there is much shark fishing. The rich shark liver yields quantities of very useful oil, while the skin makes excellent leather.



is the only tax operating in the country, the Government monopoly being operated only for the benefit of the Greenlanders.

Not much European food is imported. The Greenlanders, being used to an almost entire meat diet, are healthier when using their accustomed foods. Eider ducks, auks, ptarmigan, gulls and the eggs of the auk and guillemot are used to supplement the meat of the caribou, seal, walrus, porpoise, shark, fish and other animals.

The settlements consist of an intermixture of low stone and turf houses with some wooden buildings. They are mostly for winter habitations. In the summer the Greenlanders are away on their seasonal hunts and live in tents, but permanent dwellings are becoming more common than formerly. By means of churches, schools and trading posts and more permanent occupations, the population is losing slightly its nomadic tendencies and settling down in one place, and wooden houses are becoming more common. The Government supports the effort to secure good homes by providing suitable loans from the public funds. At the same time, European cultural necessities have been introduced: oil lamps are being gradually replaced by stoves and skin bedding by feather beds. Tobacco, tea and coffee are used a great deal, the latter in large quantities.

On account of the rigorous climate, the skin clothing, once universally used by the Eskimo and Greenlanders, is essential for winter wear when hunting. European clothing, or a modification of the old native costumes is used in summer. The embroidery and decorations on the clothing

of the women are remarkable, nearly all of them being excellent seamstresses. The bearskin trousers of the men are knee-length, reaching to the top of the long sealskin boots.

The methods of transportation in Greenland are by schooner, whaleboat or kayak in summer. Dog-driven sleds are used universally in winter, and so dogs are one of the essentials of every Greenland settlement, as in the Eskimo encampments of Northern Canada. Importation of dogs is forbidden in order that the purity and strength of this indispensable race may not be impaired.

The people of Greenland are a hybrid race. After two hundred years of whaling and colonization there are few pure-blooded Eskimos left, and the name, Greenland, is therefore used officially. This admixture of bloods has produced a race showing the great physical endurance of the pure Eskimo with his individualistic tendencies, and with the enterprise and activity of the European. The birth rate exceeds all European countries, approaching nearly forty-three per thousand. The death rate has been greatly lessened by the care of the Danish Administration, so that the increase in population per hundred is one of the highest in the world. This is tending to overpopulate some regions, since some camp settlements will only support a definite number of people on account of the movements of the sea animals on which they subsist. Greenlanders are not permitted to earn their living outside their own country, so that the only chance for expansion is the fishing industry.

The scattered and widespread distribution of the population necessitates the employment of a large number of teachers in the schools. School training is compulsory between the ages of seven and fourteen years so that there are no illiterates in Greenland. There are 170 teachers, or about one to every eighteen children. Many of the Greenlanders speak Danish as well as the Eskimo language.

There are high schools and seminaries at Godthaab, in which a two-year advanced course is provided for both sexes, and a preliminary course for clerical and other pupils. This latter course continues for two years longer than the general course. Tuition and board are free. There was

Four natives on board the *Nascopie* en route to Craig Harbour to work with the Northwest Mounted Police. The necessary permission had been granted by the Government for them to leave Greenland.

Photo by author





Holsteinsborg. Native houses and the residence of one of the Danish officials.

also a two-year continuation course in Denmark academies for apt pupils.

Gymnastics are introduced in the schools to provide the exercise necessary to balance the confinement of persons used to an active outdoor life and to encourage discipline. Handicrafts, such as carpentry, are also taught, and an active Boy Scout movement assists in keeping the Greenland youth physically fit.

The teachers must perform religious duties as well as their usual ones. In the absence of a regular priest, they may conduct Sunday services and officiate at burials and at preliminary baptismal services.

The medical services are well organized. There are ten hospitals in the colony and one sanitarium for consumptives which has the farthest location north of any in the world. No charge is made to patients in the hospitals, the public fund defraying all expenses in connection with the health of the people. Danish nurses with Greenland assistant are employed in the hospitals. The doctors are paid a fixed salary by the State, and must visit patients both in the hospitals and in their homes. They often make long trips, both in summer and in winter, to visit isolated localities.

In their social life, the Greenlanders are fond of dancing. With the introduction of gramophones and radios, the old dances are disappearing and modern ones have been introduced. Assembly halls are located at various centres for social and religious meetings, debates and other forms of entertainment.

There are no police. Serious crimes are rare, and disputes are settled by a court comprising of Greenlanders exclusively, or by Danes and Greenlanders, the latter having a majority of one. Inspectors of Districts preside at the courts.

There are two newspapers printed in the Eskimo language, both being managed and edited by Greenlanders. Both papers are free to the people. Before the current war, mail reached some localities from Denmark ten times a year, while, in the more remote settlements, the service was only once or twice annually. There are thirty wireless stations, which communicate directly with Denmark and local places, and the meteorological and shipping services are assisted by these.

A sudden change has been made in Greenland affairs with the invasion and occupation of Denmark by the Germans. Communication with Denmark has been



Greenland nursemaid with Danish baby

Some of the houses of the Greenlanders have turf walls.

Courtesy Bureau of Northwest Territories and Yukon Affairs



Right: — Greenland Inspectorate, Godhaven.

Courtesy Bureau of Northwest Territories and Yukon Affairs



cut off by sea, and Great Britain, Canada and the United States have become more interested in the country. Greenland is close to the North Atlantic sea-lanes, and it has been suggested that some of its numerous bays and fjords might provide bases for submarine or aeroplane activities of the belligerent nations. Some scientific exploratory parties have used aeroplanes in connection with their work. The Danish Geodetic Institute used hydroplanes for mapping some 211,000 square miles of coast-line, still the terrific winds, heavy fogs and general climatic conditions would likely prevent any serious aeroplane activities for military purposes. Some of the deeper fjords, however, are quite free of fogs. Ice conditions prevail most of the year; fogs, numerous reefs and islands, masking the entrance to most of the bays and harbours, would also be a serious handicap to successful submarine activities.

During recent months, since their severance from direct contact with Denmark, the Greenland authorities have taken over independent control of their own country. The Monroe Doctrine, applied to Greenland, brings it under the sphere of North American influence. Consuls have been placed in Greenland by the Canadian and United States Governments to protect the interests of the country and the Americas until the horizon has been cleared of the international complications. The Pan-American Conference is studying the question of European colonial possessions in, or adjacent to, the North American continent. What new changes may be brought to this peaceful island of Greenland only the future will reveal.



Happy smiling Greenlanders of various ages. Note the elaborate decoration on the dresses of some of the women.



Top:—High school and seminary at Godthaab.

Centre:—Gymnastics at a high school in Greenland

Bottom:—Greenland assembly hall.



Top:—A provincial council meeting, Greenland.

Centre:—Dancing in Greenland.

Bottom:—Children at play.

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EDITOR'S NOTE-BOOK

While it appears to have taken a second world war to remove the blinders from the eyes of the world, and reveal the inherent British characteristics of courage and tenacity sufficient to meet any emergency effectively, yet to those more fully aware of the Britisher, his reserves and reticences, his Peace-Time records of achievement are no less significant. "Three Antarctic Years" in this is issue typical of the Spirit of England where John Bull stands revealed not by vainglorious words but in glorious deeds, in circumstances no less demanding of heroic qualities than those of the present war. Although the background of the characters in this pre-war exploration, as indicated on pages thirteen and fourteen is that of the University, we recognize in the story unfolded by Launcelot Fleming, Brian Roberts and Colin Bertram, the same British stuff that the average Britisher has been and is displaying in the present conflict.

The companion article in this issue deals with the early history and development of Greenland — Canada's north-eastern neighbour. Mr D. A. Nichols, well-known to world geographers and to readers of the Journal, provides a most enlightening and informative article on the second largest island in the world, one within the orbit of the world-war activities. For some years in charge of Physical Geography, Department of Mines and Resources, Canada, Mr. Nichols has been in the Eastern Arctic regions for the past five summers, and is therefore particularly well equipped to write on this subject.

ANNUAL MEETING

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Engineering Topography and Erosion by JAMES M. LITTLE, E.M. (A. Carlisle and Co., 35 Post Street, San Francisco.)

This book is a mathematical treatment of erosion and erosional topography with application to geomorphology, soil science, agronomy and engineering.

The main objects of the treatise, as stated by the author, are: to develop an erosional rating for turbulent stream flow; to expand the development for land slope profiles and their surface material of soils and cover; to provide sufficient tables for practical application to problems of sheet run off,

and to tie in erosional geomorphology with hydraulics and hydrology.

A number of variable factors of the complex run-off problem have been taken into consideration and develop mathematically. In his discussion, the author deals with the scouring effects of erosion rather than with mere transportation of silt. This discussion of erosional effects constitutes a preliminary step in the problem of accelerated erosion following land utilization.

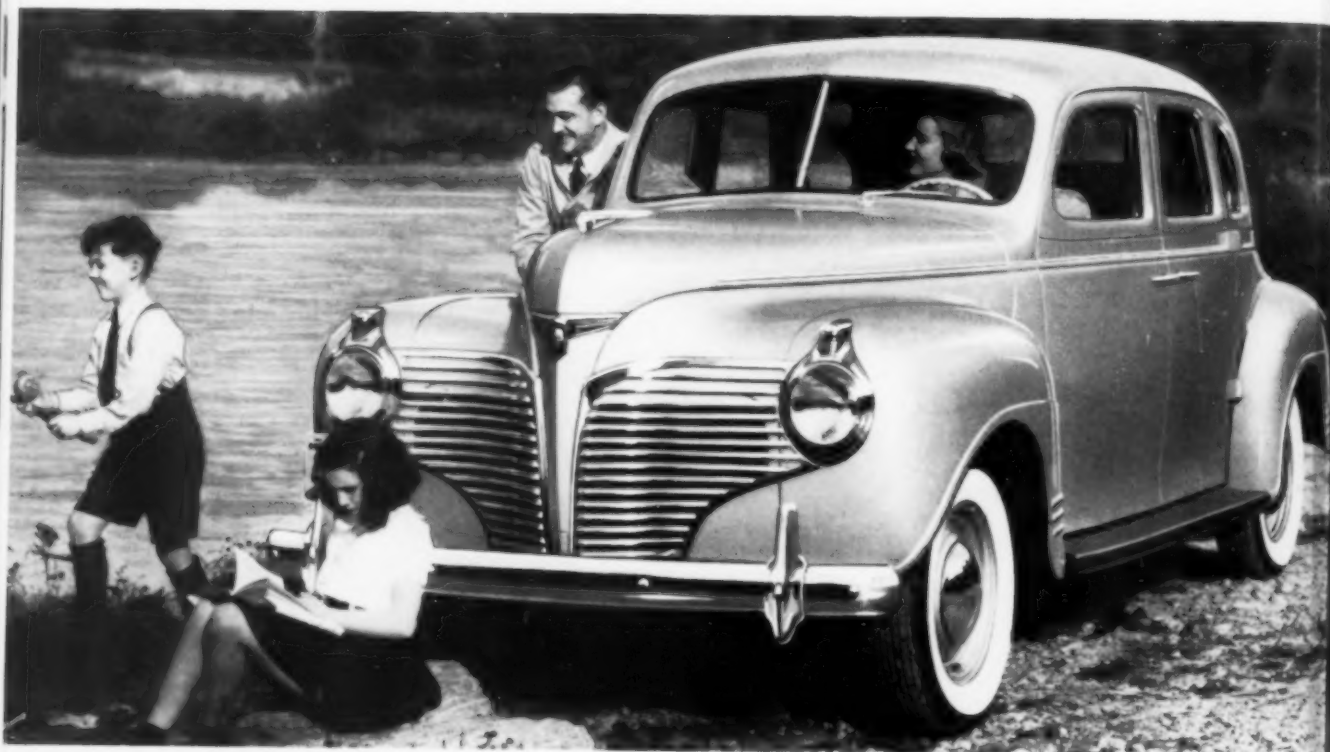
The volume should be of value to hydraulic engineers, agronomists and geomorphologists interested in the engineering side of their studies.

D. A. NICHOLS

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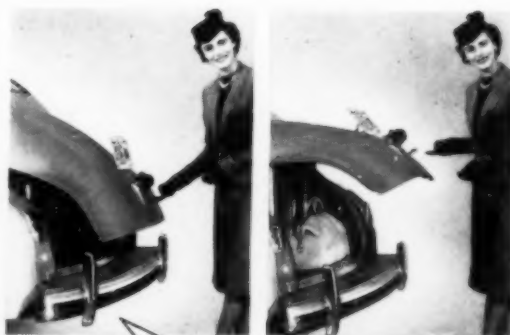
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